



COAL AGE



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No. 1

If I Were a Coal-Mine Official—I

WERE I AN OFFICER of a coal-mining company, I would start the new year with a determination to advance the welfare of the men under me, as well as strive to foster the interests of my company. I would regard my employees as my friends, not my opponents. I would link my success with their success. I would make them my partners in spirit, if I could not make them so in fact.

I would realize that my company was not an independent industrial unit, but a business responsible to the community and to the Government. I would not lie, nor brag, nor flatter, but I would endeavor to seek such publicity as would make me and my business understood. I would try to gain the confidence of all, for some day I might need the help of "the people."

I would see to it that no employee was ever denied the opportunity to express himself. I would so act that my men would organize for me, for the company and for themselves, rather than against the first two. I would make sure that those under me did not view our corporation as an organization existing solely to make money.

I would establish rules, but at the same time remember that example is more effective than precept. I would banish the thought of living on a past reputation, not forgetting that such a plan is a profitless occupation. I would submit important questions to free discussion, thus proving I was less in love with my own opinion than with the truth.

IF I WERE BOSS of one or more mines, I would not overlook the fact that neither distance nor time is the measure of success. One may travel in a circle and only get back to the starting point. Improvement, not movement, is progress. Genius is but the art of taking pains. It is intensity personified.

I would turn from the man who is satisfied with his results, for such a one has reached his culminating point. The earmarks of worth are patient preparation and the ability to complete a job in one's head before a hand is put to it. The end of doing one thing well is the beginning of doing the next thing even better.

An upstart can always be spotted by the way he shows his authority. People who become suddenly rich make fools of themselves in their handling of wealth. Men unaccustomed to exercise power generally abuse the privilege. Bluff and bluster only attract attention to one's littleness. Big men are patient, kind and courteous. I would remember that an ass can strut in a lion's skin, but he won't deceive anyone when he brays.

If I were a foreman, superintendent, or president, I would start the year with a vigorous campaign to economize minutes and motions. We can regain lost riches through energy and replace lost knowledge by study, but lost time is gone forever. A man's choice of his time is also choice of his company. I would resolve to be a miser of my moments.

[To be continued in the first issue of February]

Ideas and Suggestions

The Business Side of Mining

BY CANADIAN ENGINEER

The interesting notion that there might be a business side to mining, if we stopped to look for it, occurred to me the other day when I happened to see the announcement that *System* was considering the publication of a new journal to be devoted to the business side of farming. If there is a business side of farming, an industry that is as old as mining, why should there not be a business side of mining?

Farming is an industry that is served by a host of journals, papers and pamphlets brought out by agricultural societies, the Government, and as independent papers. In this respect it is far worse than mining in the multiplicity of the things written about it. Evidently, however, all this material is largely of technical origin; that is, it deals with subjects relative to crop growing and soil products, fertilizers and their uses, stock raising and market gardening, and seemingly also—at least we may be permitted to conclude that this is so—all these publications miss the business side; that is, the banking end, salesmanship and marketing; the proper keeping and comparing of costs, the question of operative capital and the redemption of capital.

It may be presumed that the suggested new journal is aiming at an educative campaign among farmers generally, and while it will be read by everyone, those companies that have made farming pay on a so-called scientific basis as distinguished from common or garden methods will think they have little to learn from it, because business methods have been at the bottom of their success. But these prosperous companies will provide a source of information that will be of great service to their less successful neighbors, provided it is boiled down and altered to suit the varied conditions. To convey this information from the successful ones to those who are merely just existing is probably the reason behind the new journal. Certainly that will be its field of action. There is a parallel with a difference, in the coal trade.

FARMING VS. MINING

First the difference. The farming industry totals high in collective figures, but it is largely built up of a great number of individual capitalists. Every farmer is the owner, if we except the tenant farmers as not exactly coming within this category, of his own place. The tenant farmers are in the same position as the lessees of a mine. The farmer employs labor in large numbers in the aggregate, but again each farm has generally very few employees; that is, comparing it with mining operations. The coal-mining industry, on the other hand, is made up of concerns that are not only much larger capitalistic ventures than the individualistic farmer, but there are also more large companies in the business than there are large farming companies. Again, too, the coal-mining concern, private or company run, employs its labor in greater groups, and while the actual labor may not be more highly educated

than the farm laborer, we can at least contend that there is a far greater difference between the coal miner and the colliery officials, as compared with the farmer and his men. This may be due to the dangers of the first-named calling, demanding quickness and knowledge; but it is also due to a correct impression of the value of time, a thing the average farmer does not properly appreciate.

The parallel may be somewhat contradictory to some of the foregoing remarks. Despite the statement that the coal trade consists mainly of large collieries, it must be admitted that there is another side to the question. The organization of collieries in large groups may indicate a much greater appreciation of the business principles of mining than the farmer has of his business side, but there is also in mining, every year, a great procession of companies that come to grief from various so-stated causes: every year sees a new list of operators destined to fail before they start, and every year there still remain with us the small struggling property holders and miners, whose capital investment represents all the available resources of one or two men. These men and this class of mining venture are visible in every field, and the fact that they exist seems to imply that there is something wrong with the business side of mining.

BUSINESS ORGANIZATION MOST OFTEN AT FAULT

In mining, as in farming, it is either the technical or the business side that is at fault. The technical side is well cared for, and it is my experience that the actual mining is commonly well done. It is far more common to find something wrong with the organization of the company than it is to find something equally as wrong with the plant or the method of mining. There are such things as large properties with inadequate capital; small properties overcapitalized; companies where the organization expenses form too great a proportion of the working capital; companies whose cost of operation is greater than the cost of mining; companies that have to face a heavy cost for redemption of capital; companies tied on to plant and transportation systems that they have to support; companies where costs are kept in the manager's head and where others have no real knowledge how the business is going, but are satisfied as long as they can sell coal.

There are hundreds of similar cases, and what can they be due to but a want of appreciation of the business side of mining—the relationship of capital and profit to operation and expenses and to size of areas and outputs. To get the greater success these factors must be in exactly the correct relationship, otherwise there is a sacrifice of efficiency in the company's organization. How many of the smaller concerns are clear upon this point?

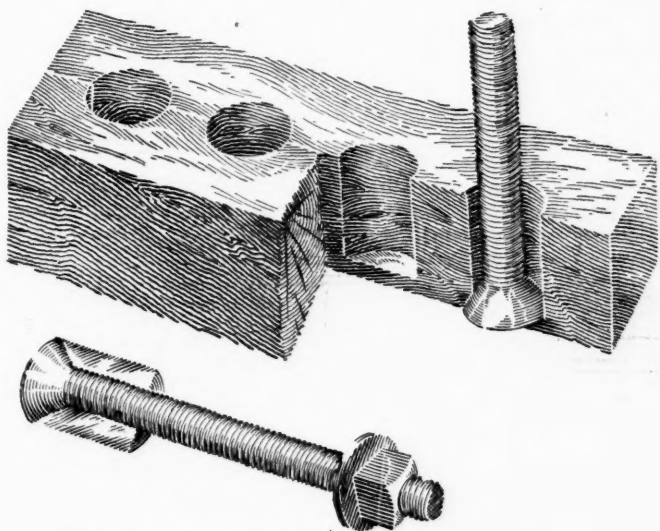
It would appear, then, that there is a business side to mining which, if we search for it, appears to be just as pronounced with us as it is with the farmer; only, as we show our success over the whole country in terms of dividends paid out, while the farmer merely stays where he was, our want of business knowledge is not so

self-evident as that of the farmer. To get a technical journal to approach this business side is always a delicate task, because it then begins to come within the realm of company promoting. It may become tinged with a class of business and trade that it does not want. To this extent the business side of mining again differs from that of the farmer or the commercial man. The question of the proper promotion and organization of coal companies should not be overlooked, since it is there that the root of the trouble most frequently lies.

Nevertheless, this is a field of work that should not be shirked. Do coal-mining men realize that every time a coal-mining venture is allowed to be commenced on an improper basis it is being made more difficult for them to carry on the industry?

Making an Expansion Bolt

Making an expansion bolt that is satisfactory, especially for light work, is an easy matter when done as illustrated, according to F. F. Sengstock in *Power* for Dec. 19, 1916. Make a mold by clamping together two blocks of wood and boring a hole (half in each block) the size



MOLD TO CAST LEAD SHEATH AROUND A BOLT

of the hole into which the expansion part of the bolt is to go and the depth required. Into this mold place a stove bolt (any other kind will do) threaded well down toward the head as shown, and pour molten lead around it. When the bolt is placed in position and the locknut is tightened down hard, the lead will swage out and hold the bolt securely. A countersunk head will help the bolt to expand the lead sheath.

Rapid Surveying with a Bicycle

A method for rapidly marking geological and topographical details on maps is described by Leslie H. Ower, in the *Proceedings* of the Australasian Institute of Mining Engineers, Sept. 30, 1916. For the field work he uses a bicycle equipped with a standard make of cyclometer, designed to register distances in miles and tenths of miles. Instead of using but one striker, eight are employed, so that, for each revolution of the bicycle wheel, eight impulses are given to the vanes of the cyclometer. By

ignoring the decimal point, the reading is in chains instead of miles. The author has found, by checking distances on existing maps, that with 1½-in. tires the maximum error is 2%, a low reading being obtained when leading the bicycle with tires pumped hard. When riding, the depressing of the tires reduces the radius, with a corresponding reduction of the error.

For field notes an ordinary level book may be used, with the headings as shown herewith:

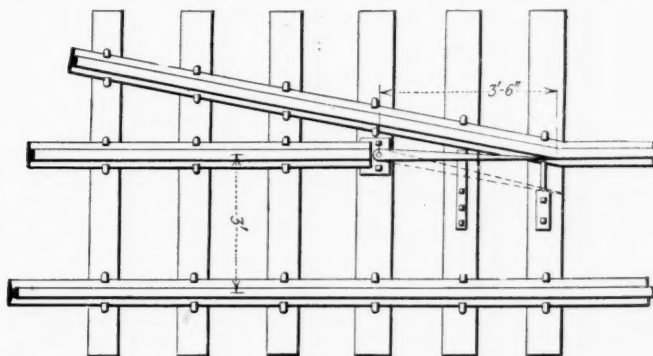
HEADINGS FOR FIELD NOTES						
Total Distance	Net Distance	Geology	Time	Aneroid Reading	Reduced Level	Remarks

For noting the time a wrist watch is recommended, and for altitude an aneroid barometer, recording differences of 10 ft., to be carried in the right-hand coat pocket. It is found that after a little practice the average time required to record the cyclometer reading, the direction since the last reading, the class of country, the time, the aneroid height, the locality, and to offset by eye any physical feature, is about 50 sec. Readings are taken whenever there is an appreciable change in direction or at other obvious points, according to the nature of the work in progress.

Simple Derailing Device

BY THOMAS E. MYERS*

It frequently happens that a parting must be put in on more or less of a grade. This is a constant source of danger from runaway cars. The simple derailing device shown in the accompanying illustration, which has been in successful operation for some time at the plant of the



PLAN OF THE DERAILER

Chicago & Big Muddy Coal and Coke Co., obviates this danger.

This appliance may be placed just outside the parting switch so that neither loads nor empties can run far enough to gain dangerous headway before being thrown from the track.

When the latch is closed, it rests against, and is held in place by, a twisted fishplate spiked to a tie near the latch point. It is necessary to lift this latch point in order to open it. This operation must be performed by hand.

*Marion, Ill.

Latest Improvements for the Preparation of Bituminous Coal*

BY WARREN ROBERTS†

SYNOPSIS—A few years ago bar screens performed the only preparation that coal received at the mine. Next came the shaking screen, to which was later added the picking table and loading boom. The latest apparatus is a combined horizontal screen and picking table, with shaker loading booms. These accomplish all that can be done with the older devices and at less expense for equipment and housing.

I fully appreciate that the subject of bituminous coal preparation is not one of immediate importance to coal producers.

If I wished to touch your fancy, I should announce my subject as "How To Secure the Largest Allotment of Railroad Cars"; or, possibly, "Methods for Attracting Labor to Mines."

I regret that it is beyond my power to extend assistance in this direction, and I can only offer my sincere

One of the most notable differences between a civilized and a barbarous people consists in the forethought of the former, in a constant planning to meet the needs and requirements of the future. People, therefore, in civilized communities, who do not exercise these prerogatives of the cultured race, are called improvident or shiftless, because they exhibit the qualities of the less civilized races of the earth.

As an indication of the wisdom of those engaged in the production and sale of bituminous coal, I have noted during my travels throughout the coal states during the past few months a widespread interest in improvements looking to a much better preparation. In fact, the present abnormal high price for every kind of equipment does not seem to lessen the desire of operators to contract for their improvements now, that they may have them ready for use when the present market conditions have changed to something less favorable.

I have spoken often in the past at gatherings of coal operators on the subject of "The Better Preparation of

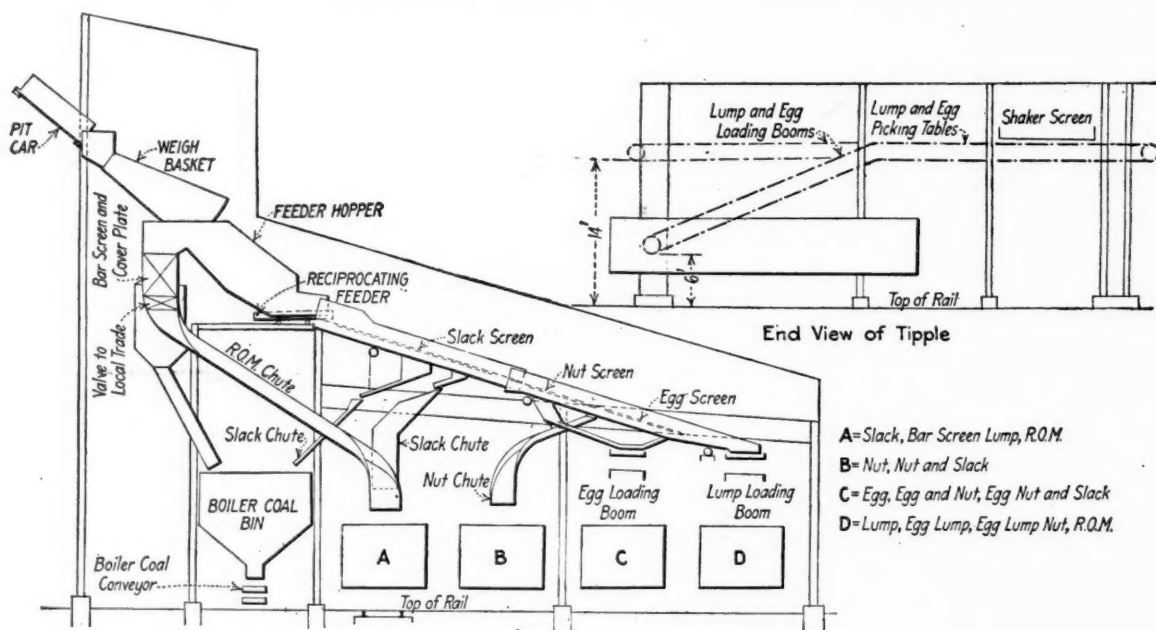


FIG. 1. DIAGRAM OF TIPPLE WITH INCLINED SHAKING SCREENS

sympathy and hope that the unfavorable conditions now existing will be alleviated in the near future—at least in part.

At the present time, a "better preparation" of coal does not offer the same advantages that it did a few months ago; or possibly, that it will a few months hence. But, if we learn from experience—and we sometimes do—we know that other conditions than those that now obtain will return to us all too soon.

If this presumption is correct, then it is the part of wisdom to make our plans now to meet future requirements, which we foresee.

*Paper read before the West Virginia Mining Institute, Huntington, W. Va., Dec. 13, 1916.

†Chicago, Ill.

Bituminous Coal." In fact, I have the honor of having been one of many who have labored for years for the improvement of all the conditions in connection with the production and marketing of bituminous coal.

It has been evident to those who have studied this industry critically, that better methods of production and preparation and improved conditions of marketing must be obtained before the results would be commensurate with the vast capital invested, the amount of human energy expended or the importance of this industry to the nation.

For several years there was scant encouragement for those who labored for these improvements, but more recently operators have recognized the advantages that would result from the economies which were advocated.

and during the last few years in particular, there has been a decided advance in conditions generally connected with the production and marketing of coal.

It is not necessary to mention in detail these betterments, as you are already familiar with them. I wish, therefore, to mention briefly only the advance made in the preparation of bituminous coal *after* it is mined.

Before entering upon a discussion of the improved methods adopted above ground for the preparation of coal, it may be well to mention that some of the advantages thereby gained have been lost by a corresponding decline in the care formerly exercised in mining. This change in underground conditions is also familiar to all operators, who recognize that the class of labor now employed makes it impossible to obtain the same results as formerly with experienced miners—men who took a real pride in their vocation.

The constant desire for increased tonnage in an earnest endeavor to reduce cost of production has doubtless also influenced the quality of the product.

The introduction of machinery for doing a large part of the work formerly done by experienced miners has also brought about new conditions which must be met

Since progress can only be noted by comparison with some standard, either past or present, I must describe a standard tipple equipment first of yesterday and then of today.

Just a few years since, the only preparation which the coal received in the tipple consisted in running it over one or more bar screens and then loading the different sizes through fixed chutes directly into railroad cars.

The entire equipment for the tipple at that time consisted of either a crossover dump, or possibly for a small mine, a horn dump; or for a shaft mine, self-dumping cages; or possibly platform cages with crossover dump, and a standard set of bar screens and chutes mentioned above. Usually there was added a platform scale in connection with the crossover dump, or a tipple scale and weigh basket in connection with self-dumping cages. This equipment was as inexpensive as it was simple, and the tipple structure was accordingly inexpensive.

But, the new methods of mining and the changing market conditions demanded a better preparation. To meet this demand the shaker screen was gradually introduced to replace the bar screen. Following the introduction of the shaker screen picking tables were added

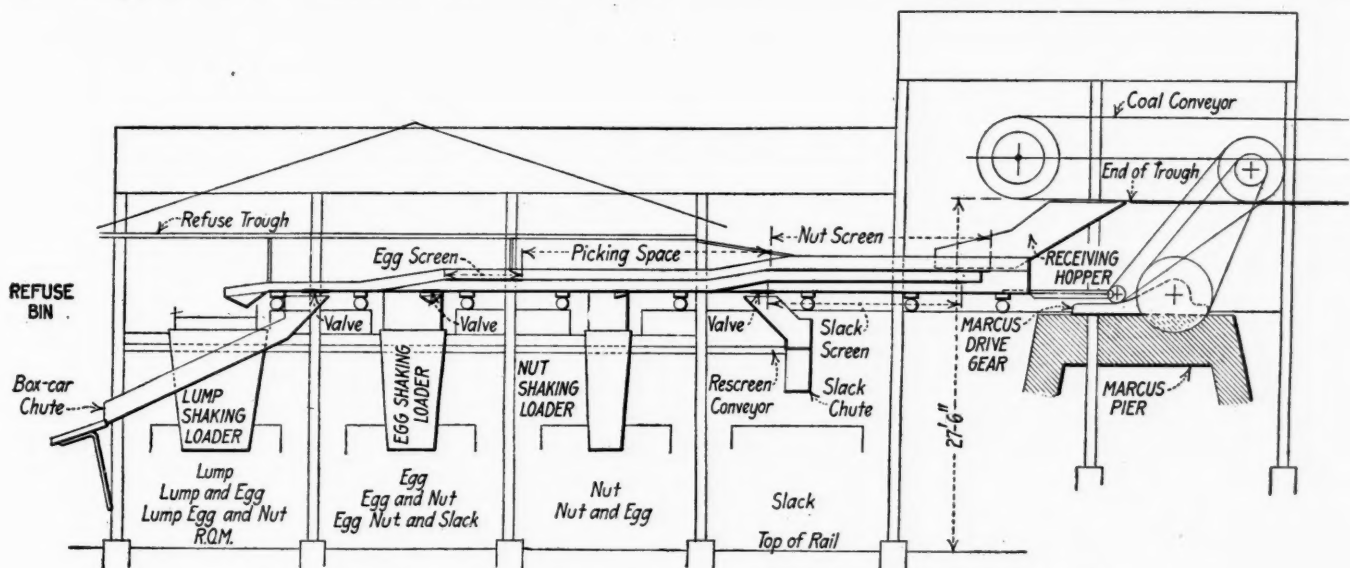


FIG. 2. DIAGRAM OF TIPPLE USING MARCUS SCREEN AND PICKING TABLE

and offset by a different and better preparation above ground.

While this is all introductory, it is interesting in connection with the discussion of the immediate subject, for the reason that those who design and build plants for the preparation of coal must modify their designs and vary their equipment from time to time to meet the changed conditions in mining and the new demands of markets.

Preparation that was considered satisfactory yesterday will not answer today, and tomorrow we must expect to meet new conditions. But these constant demands are not discouraging, instead they are an incentive to greater endeavor and are one of the factors which make our profession of interest, almost beyond any other.

My subject as announced would include the equipment for the preparation of bituminous coal for all purposes; but since space will not permit of discussing the entire subject, I will not consider the preparation obtained by washing coal, but confine myself to the improvements in tipple equipment.

for removing the refuse from the larger sizes of coal; and still, a little later, loading booms for more carefully loading the larger sizes.

When this evolution had been completed, we had a standard shaker screen tipple equipment, such as I shall now describe and illustrate.

While this equipment, to a certain extent, has been standardized, yet each individual installation must be arranged and designed to suit the particular conditions at the mine where it is to be used, as well as the requirements of the markets which this coal is intended to reach. It will therefore be necessary to select an equipment which will be as nearly typical as possible.

I shall therefore describe a standard shaker screen and picking table equipment for a large shaft mine located in central Illinois.

Referring to Fig. 1, the coal is hoisted from the pit bottom to the point of dump with standard self-dumping cages, by which it is automatically dumped from the pit-car into the weigh basket, where it is weighed on a run-of-mine basis.

After being weighed, the entire charge of coal is dumped immediately into the receiving hopper, from which it is fed regularly by a reciprocating feeder onto the shaker screens. The feeder should have an adjustable stroke which enables the rate of feed to be regulated to meet the maximum speed of hoisting required at this mine, to the end that each pit-car of coal shall be fed out of the receiving hopper by the time the next load is discharged from the weigh basket, thus obtaining a regular distribution of the coal to the shaker screens.

This arrangement gives the best possible results in the sizing of the coal for any particular set of screens.

This being a four-track installation, the slack is taken out, as indicated, by the upper screen and delivered by a properly designed chute directly into the car on the slack track. A part of this product may also be diverted by an auxiliary valve in the lower deck of the slack screen and sent to the boiler coal bin in the location indicated on the plan. From this bin the coal is taken to the boiler room by a conveyor.

The nut coal is removed on the upper end of the lower screen and delivered by a curved end loading chute directly into the car on the nut track.

The egg coal is next removed on the lower section of the lower screen and delivered carefully onto the egg picking table and loading boom.

The lump passing over this egg screen is delivered off the end of the lower screen directly onto the lump picking table and loading boom.

COMBINATIONS MAY BE MADE

In addition to the four divisions of coal which may be loaded separately into the slack, nut, egg and lump cars as described above, any combination of these sizes may be made by simply closing valves in the lower deck of the screen. That is to say, the slack coal may, for instance, be loaded with the nut, thereby making a combined nut and slack for stoker use or any similar purpose.

By closing a valve in the nut screen, the nut coal may be carried over and delivered onto the egg picking table and loading boom and loaded out with this coal, thereby making the combination of egg and nut. This product is first picked and then carefully lowered into the railroad car.

If a further combination of sizes is required, the slack may also be brought forward and loaded out over the egg loading boom with the nut and egg, thereby making a run-of-mine coal up to and including egg size.

Lastly, by closing the valves in the lower deck of *both* screens, run-of-mine will be delivered to the lump picking table and loading boom and loaded out over this boom as run-of-mine coal, including such picking as it is possible to make on a run-of-mine product, which is meager.

I have spoken of the egg and lump picking tables and loading booms, which may be seen in the end view of the tipple, Fig. 1. By these expressions I was describing a combination of picking table and loading boom; that is to say, a picking table, the lower section of which is hinged and may be raised and lowered with a power hoist operated by electricity, steam or compressed air.

These booms have a range in height sufficient to properly trim the highest hopper-bottomed type of coal-car,

or may be lowered sufficiently near the bottom of the car to prevent breakage at the beginning of the loading process.

This particular installation is arranged for making either bar-screened lump or run-of-mine coal on the slack track, without the operation of the shaker screens.

This is only an emergency arrangement to be used in case of accident to the shaker screens or picking tables. It is accomplished by simply dumping the coal from the weigh basket backward into a chute which passes the coal over a bar screen from which it is delivered to a properly designed end loading chute into a car on the slack track.

The slack removed by this arrangement is delivered to the boiler coal bin by a chute, as illustrated on the plan.

If it is desired to make run-of-mine coal during an emergency, the cover plates of the bar screens are lowered and the entire product is delivered into the car on the slack track.

In addition to the foregoing, there is a gate in the chute, just below the bar screen spoken of above, which diverts the coal in the opposite direction from the run-of-mine chute and delivers it into the local trade bin to supply the wagon trade at this mine. This arrangement supplies the wagon trade with bar-screened lump.

A COMPREHENSIVE EQUIPMENT

It will be noted from the description that this is an exceedingly comprehensive equipment for the preparation of coal, giving almost any size or combination of sizes which present markets require. In addition, it furnishes coal for boiler use and the wagon trade.

Experience, however, has taught us that this elaborate equipment does not give a final preparation meeting all the requirements of the domestic trade.

Referring again to the lump and egg picking tables and loading booms, it will be noted that these picking tables are of the standard moving apron type, on which the lump and egg sizes are picked and then delivered directly into their respective cars by the raising and lowering sections forming the booms. This type of picking table, however, does not lend itself readily to the re-screening of the lump and egg sizes after being picked, and as the domestic markets require these sizes to be free from nut and slack, as well as from refuse, it is necessary that these sizes should be re-screened after picking. This requirement has been met by a loading boom of new design which will be described shortly.

I have much hesitation in describing an equipment which I consider most nearly complies with the subject in hand; namely, "The *Latest* Improvements for the Preparation of Bituminous Coal." In the past, papers have been written and published describing certain equipment which, on account of its being patented and controlled by one company, placed the person describing such equipment, or machinery, in an attitude of advertising his own goods. This is a thing any manufacturer or engineer with the proper sense of modesty hesitates to do.

This is the rather embarrassing situation in which I find myself. And yet I would not feel that I had adequately covered the subject of the *latest* improvements, unless I described and illustrated what I sincerely believe to be an equipment far in advance of any other

now on the market for the preparation and the loading of coal. I will therefore, at the risk of being criticized, briefly describe this unique equipment.

The standard shaker screen and apron picking table equipment described before requires several units to furnish the preparation of sizing and picking. It is highly desirable in designing any plant for any purpose to reduce the number of units of machinery entering into its construction and simplify each unit as far as possible consistent with the best results.

With this object in view, Professor Marcus invented a combination screen and picking table which will now be described.

Referring to Fig. 2, since the manner of delivering the coal to the screen—that is, whether by pit-car direct through crossover dump, or in the case of a shaft by self-dumping cages or by conveyor—will somewhat vary the equipment, I will in this case, as before, have to select a plant which will be as nearly typical as possible.

It is therefore assumed that the coal in this case is brought to the plant by a conveyor and delivered directly into the receiving hopper from which it is delivered onto the screen. If the coal was brought in the pit-car to a point directly above the receiving hopper and deposited therein by means of a crossover dump, the only difference in the design would be the insertion of a feeder at the lower end of the receiving hopper for regulating the flow of coal onto the screen. On this plan the same result is accomplished by the conveyor.

NUT AND SLACK REMOVED FIRST

After delivering the coal onto the upper deck of this horizontal screen, it will be noticed that the nut and slack are first removed in combination on the upper deck and then the slack is removed from the nut on the middle deck; carried forward on the lower deck and delivered through the gate in this deck by a properly designed chute into the slack car.

The nut passing over the slack screen (on the middle deck) is delivered down the sloping plate gently onto the bottom deck in front of the slack gate and passes through the nut gate onto a loading boom, by which it is lowered carefully into the car on the nut track.

The balance of the coal—that is, all the sizes above the nut—is now picked on the top deck, after which the egg coal is removed by the egg screen and delivered by the loading boom into the car on the egg track, while the lump coal passing over the egg screen is lowered by the sloping plate onto the bottom deck and passes out over the end of the Marcus screen onto the loading boom, by which it is carefully lowered into the car on the lump track.

Any combination of sizes, such as nut and slack in the nut car; egg and nut, or egg, nut and slack in the egg car and all combinations up to run-of-mine in the lump car may be made on this horizontal screen by simply closing certain valves in the bottom deck.

Particular attention is drawn to this feature of the screen, as it does away with the cumbersome and noisy cover plates which were formerly used on shaker screens for accomplishing the same result. This is now done easily in the manner just explained.

An extra valve is placed near the outer end of the screen which may be opened to deliver lump or any combination of coal up to run-of-mine into a chute pass-

ing beneath the loading boom and into a box-car on an outside track. This is a convenient arrangement, since it permits the box-car to be placed, the box-car loader put into position, and then by opening the gate referred to above, coal is immediately delivered into the car without the usual delay occasioned by the use of the box-car loader.

When the box-car has been loaded, the gate delivering coal to the box-car chute is immediately closed and loading over the boom into an open car is resumed until the loaded box-car has been replaced by an empty with the box-car loader inserted, ready for another operation. By this arrangement, box-cars may be loaded without in any manner cutting down the capacity of a mine, which is one of the chief objections to loading coal into box-cars with a loader.

It will be apparent that the unique feature of this horizontal screen is the ability to both screen and pick the coal with one unit, thereby saving a great duplication of machinery.

If it is desired also to pick the nut coal, thereby increasing the proportion of the output from the mine, which shall be hand picked, a different arrangement of the screening and picking decks is provided in order to accomplish this purpose.

If the tonnage from the mine and the amount of picking required is such that the best results cannot be accomplished with a single Marcus screen, a pair of screens placed side by side are employed. This enables large tonnages to be carefully screened and perfectly hand-picked with only two units as against several required when shaker screens and apron picking tables are used.

HORIZONTAL SCREEN SAVES HEADROOM

A comparison of the character of the Marcus horizontal screen with the standard shaker screen is also greatly to the advantage of the Marcus. In the first place it is a horizontal screen and therefore saves several feet in the height of a tippie. This varies from 8 to 14 ft., depending on whether it is a 2-, 3- or 4-track tippie. Moreover, the entire construction of the tippie is much simplified by the use of the horizontal screen, as will be apparent from an observation of the plan.

The entire moving machinery for accomplishing all results of both screening and picking are combined in the Marcus "drive gear," which it will be noticed is placed on a concrete pier at the rear of the screen. Aside from this driving gear there is no machinery whatever to a Marcus combination screen and picking table, with the exception of a few sets of small rollers which act as bearings to support the weight of the screen and coal.

One has simply to compare this equipment with the mass of machinery which would be required with standard shaker screens and a number of apron picking tables used to accomplish the same results to see the great simplicity of the Marcus as against the other equipment.

The all-important question will now arise, "Will the Marcus do the same work as the best grade of shaker screens and apron picking tables?"

I can answer this question in the affirmative, and in addition state that it will size the coal more accurately and with much less breakage than shaker screens. It also offers better opportunities for removing the refuse

than can be obtained on the standard apron type of picking table.

Anyone who doubts these statements can verify them by a careful and critical observation of the two kinds of equipment. I do not draw my conclusion from personal observation and judgment—although I have seen some fifty Marcus screens in operation—but from the statements made by a great number of experienced coal operators who have made a careful comparison of the results obtained by each class of equipment, and who then unhesitatingly stated that the Marcus screen was an equally good separator and a better picking table than the other equipment.

If these statements are correct, and it seems that they have been thoroughly demonstrated by more than seventy such screens in this country, there is no question but that the advance made by the introduction of the Marcus horizontal screen replacing the cumbersome combination of shaker screens and apron picking tables to accomplish the same results is the greatest single im-

Referring to Fig. 3, it will be noticed that the boom is made in two sections, the upper section being fixed as regards elevation and placed as close to the Marcus screen as operation will permit, so as to prevent any fall and breakage to the coal. The lower section is hinged at the upper end and is raised and lowered at the lower end by a power hoist, the same as in the case of the apron type of boom.

Two or three decided advantages may be noted in this shaker boom as against the apron type. The first and most important of these considerations consists in the fact that the coal may be re-screened on the upper section of the boom by inserting a short section of perforated plate which removes all fines. These are collected and deposited in a conveyor just below.

This same conveyor can collect the fines from the lump, egg and nut boom and deposit them in the slack car at the same point where the slack coal from the screen is deposited. This gives a perfectly clean lump, egg and nut for delivery onto the lower section of the boom,

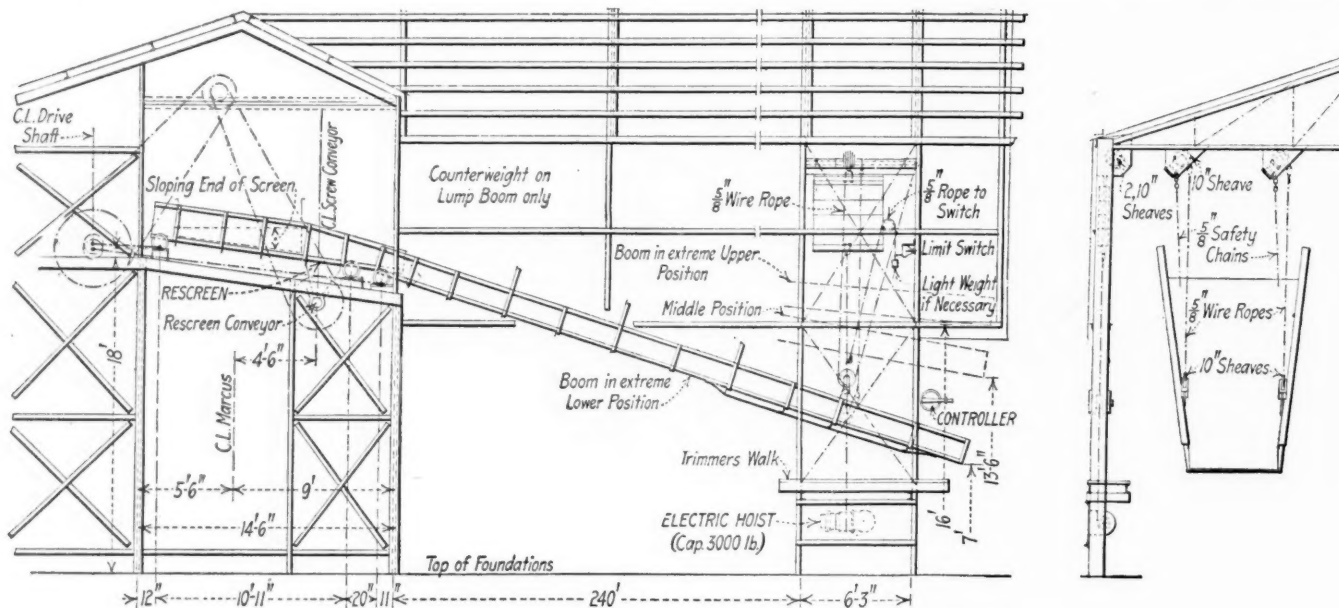


FIG. 3. END VIEW OF TIPPLE, SHOWING SHAKING LOADING CHUTE

provement that has ever been made in equipment for the preparation of bituminous coal.

I therefore believe that I am warranted in bringing to the attention of coal producers this unique and valuable equipment.

After the successful introduction of the Marcus screen for the preparation of coal, it seemed important that some equipment should be devised for properly loading this prepared product into railroad cars without the use of the complicated and expensive apron loading boom.

At first, several different designs of telescoping and raising and lowering chutes were tried, but unsuccessfully, as the time required to manipulate these chutes made their use impractical for any except a small mine.

However, the use of these extended chutes furnished the suggestion for the "shaker loading boom," since this is nothing more nor less than a long chute. This shaker loading boom is now made in two or three slightly different designs to meet the requirements at mines of different capacities.

I will describe briefly a design for a mine of large capacity:

which carries this coal carefully down to the point in the car where it is to be loaded, whether this be at the bottom of an empty car or the top of a 10-ft. hopper.

Secondly, it will be noted that there is no drop from the end of this boom, as is always the case with an apron boom. All the coal from the end of the apron boom always falls from 1½ to 2 ft., and although it falls on coal, there is considerable degradation at this point. This is not very noticeable at the mine, but is readily discovered at destination.

This shaker boom accomplishes all the work that can be done with the apron type of boom at less first cost, with less power to operate and much less maintenance. It would therefore seem that this simple device is a marked improvement over the apron type boom, and this is my justification for presenting it.

The combination of the Marcus horizontal screen for the sizing and picking of the coal, and of the shaker loading boom for re-screening and loading the coal carefully into railroad cars, gives the maximum of results with the minimum of equipment, together with the simplest and most inexpensive structure for housing it.

The Iron Pyrite Found in Coal

By C. M. YOUNG*

SYNOPSIS—The Missionfield Coal Co. takes pyrite from coal produced in its stripping and crushes, cleans and sells it. The price is \$3.50 per ton. About 12,000 tons are produced per annum. The venture has not been unprofitable. About one car of pyrite is obtained for every 20 cars of coal mined in the stripping.

The Missionfield Coal Co., of Danville, Ill., is a pioneer in two ways, both of which are interesting. In the first place this company, of which W. G. Hartshorn is president, used the first of the large revolving steam shovels which now produce such large amounts of coal in the various stripping districts. This was built by the Marion Steam Shovel Co. in accordance with the plans furnished by the coal company and was put to work in 1909.

It is now antiquated, but it was so great an improvement over preceding excavating machines that it soon ceased to be considered an experiment and was followed by many of its kind, each larger and stronger than its predecessor. In the second place this company is a pioneer in the preparation of pyrite from coal for the market. It is this second phase of the company's work that is to be discussed.

THE ORGANIC AND PYRITIC SULPHUR IN COAL

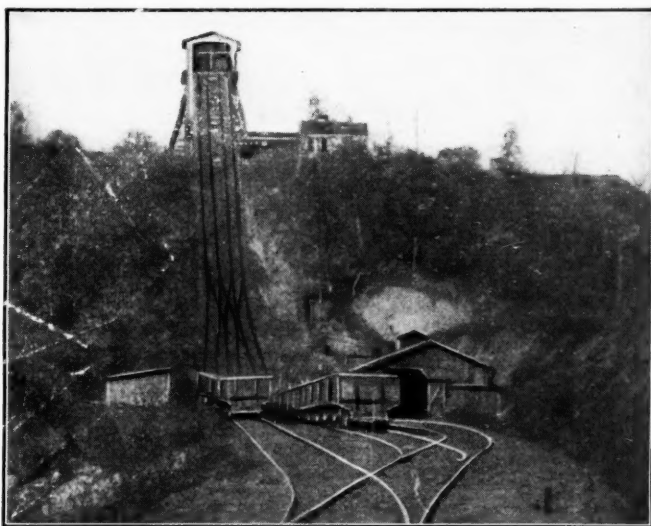
Sulphur, which is one of the main impurities of coal, exists in such deposits in two principal forms. One is the so-called organic sulphur, which is believed to be one of the original constituents of the coal, having its origin in the vegetable matter from which the coal was formed. Even now, after much research into the nature of coal, the exact form in which this sulphur exists is not determined. The other form of sulphur in coal is well known. It is iron sulphide, FeS_2 , commonly known to the miner as "sulphur." Mineralogically, this is most commonly known as pyrite, though it seems to be a fact that the substance found in coal is more frequently marcasite, a mineral of the same chemical composition but of different crystallization. Presumably it is not one of the original constituents of the coal, but is an added impurity.

Unlike organic sulphur, it is not uniformly disseminated throughout the coal substance, but is largely segregated in sheets or concretions. These vary in thickness from the thinnest films to deposits several inches thick. It is supposed that this pyrite was precipitated by the reducing action of the coal substance from water carrying iron sulphate in solution. However this may be, it is at least certain that this sulphur now exists as a separate substance distinct from the coal, and therefore it may be mechanically removed. Of course, if the pyrite is in thin leaves or small particles scattered with some uniformity through the coal, this separation would not be a profitable undertaking, but in cases where the pyrite is in the form of fairly large concretions, it is not only possible to separate it, but it may be profitable to do so.

This process is common and a great deal of coal is thus improved, and this is especially true of coals used

in the manufacture of metallurgical coke. In all cases the prime object of the removal of pyrite is the improvement of the quality of the coal or of the coke to be made from it and not the recovery of that mineral. There are several companies that market this pyrite, but, as far as I know, only one that cleans it by washing. As a matter of fact the washery at Missionfield produces pyrite as a main product and washed coal as a byproduct, thus reversing the usual order of importance in the output of plants where coal is washed.

That pyrite is really a substance of commercial importance is shown by a consideration of the figures of production and importation. The imports in 1915 amounted to 964,634 long tons and the domestic produc-

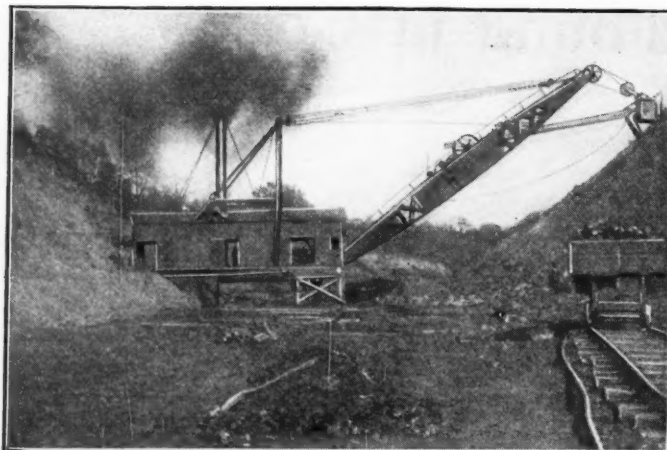


INCLINE BY WHICH COAL IS LIFTED FROM PIT

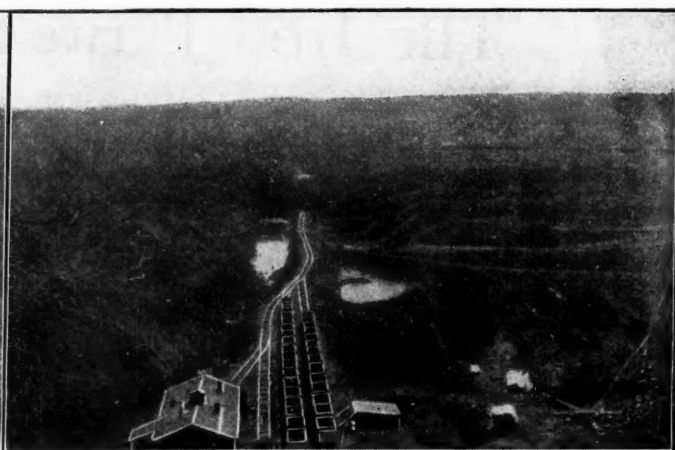
tion to 394,124 long tons, or 29 per cent. of the consumption. Of the domestic pyrite, 14,849 long tons is credited by the United States Geological Survey to Illinois, 972 long tons to Indiana and 10,857 long tons to Ohio. All the pyrite produced in these states, except a little from northwestern Illinois, which is credited to Wisconsin and in the report quoted is not included in the amount credited to Illinois, was a byproduct of the coal industry. That is, of the 394,124 tons of pyrite produced in this country in 1915, only 6.79 per cent. is credited to districts whose pyrite comes from coal. Possibly this figure is a little low, as small quantities of pyrite are marketed from this source in other states, for example Pennsylvania. There is no means of knowing how much is picked from coal and thrown away, but the amount must be large.

Not only is the marketed quantity of pyrite from coal low, but the price is also comparatively low. The prices given by the United States Geological Survey are: \$5.03 per ton for Virginia, \$3.75 for California, \$3.17 for Indiana, \$2.52 for Ohio and \$1.51 for Illinois. The last price must be too low, as the Missionfield Coal Co. states that its price is \$3.50 per ton and that it produced and sold 12,000 tons in 1915, so that the low prices of other producers would not be of sufficient weight to bring the price for the state down to the figure given. The prices quoted

*Assistant professor of mining research, University of Illinois, Urbana, Ill.



THE 8-YD. SHOVEL STRIPPING THE COAL



STRIP PIT SEEN FROM TOP OF INCLINE

by the United States Geological Survey are based on reports of the producers, and the low price for Illinois must be the result of some confusion in these reports.

The reason for the comparatively low price of pyrite from coal is the belief formerly held by many consumers, and still held by some, that pyrite from coal could not be used satisfactorily for the production of acid. The principal trouble has been caused by particles of coal adhering to the pyrite, or possibly extending into cracks in the concretions, giving a smoky gas that obstructed the tubes with soot and gave a product of dirty color. Aside from this, there seems to be no objection to such pyrite. Its chemical composition is satisfactory and it can be produced in proper sizes.

BITUMINOUS IMPURITY CAN BE FILTERED OUT

The objection founded on the presence of coal is very largely removed by the treatment given at Missionfield, though it has not been found practical to remove every trace of carbonaceous material. However, it has been found by some of the consumers that it is a simple matter to filter the gas, and with this treatment the objection to pyrite from coal seems to disappear entirely. It may be granted that a higher price will have to be paid for pyrite if its production for the market is to be secured in large quantities. But if this encouragement is given to the producers, they will be able to supply a large quantity of pyrite which can be used with satisfaction and will even then be lower in price than the pyrite now obtained from other sources. There undoubtedly is some carbonaceous matter in the pyrite from coal and this product would have to sell for enough less than other pyrite to pay the cost of filtering the gas, but this expense is not enough to account for the difference in price between pyrite from the coal mine and that from other sources.

This difference seems to be founded largely on the fact that users do not know that pyrite from coal is available and satisfactory, and the additional fact that the only company that is cleaning such pyrite is already selling its product with little trouble, so that it does not feel the need of any extensive campaign of education. At present consumers are paying from \$5 to \$7 per ton for large quantities of pyrite, while most of that picked from coal is thrown away. It may be true that the pyrite from coal stands storage slightly less well than other pyrite, but this, if true, does not seem to affect the favor with which it is received by the present users.

The interesting question, then, is why pyrite is cleaned by only one company and sold by only a few while others throw it away. Possibly it will be best first to see what the Missionfield Coal Co. is doing and then, with this as a background, look at the possibility of the profitable saving of pyrite elsewhere.

The Missionfield Coal Co. operates strippings near Danville, Ill. The coal mined is named by the State Geological Survey No. 7 bed, and it is otherwise known as the Danville Seam. This coal is 5 ft. 8 in. thick at the Two Rivers stripping, where the pyrite washery is operated. It is not of high quality and contains rather large quantities of pyrite. This is in sheets, bands, stringers and kidney-shaped concretions. They lie principally near the bottom of the bed, but are found scattered more or less through it, so that they occupy about 5 per cent. of the volumetric content of the bed, the Missionfield Coal Co. getting about one car of uncleaned pyrite for every twenty cars of coal. Where the cover is thick, the bed is mined by ordinary methods; but in stream valleys, where the cover has been eroded, it is stripped.

PYRITE IS REMOVED ON TWO PICKING TABLES

In all cases the pyrite is picked out. Since the coal is loaded by steam shovels in the stripping mines no picking can be done in the pit, but the coal is passed over picking tables in the tipples. At Missionfield there are two steel-belt picking tables, each 6 ft. wide and each served by four pickers. The pyrite goes to cars in which it is transferred a few rods to the washery.

The washery is modeled after the concentrating plants of the Joplin district and was built by a company formerly located in that district but now out of existence. Apparently the washer was designed without sufficient investigation or without sufficient skill, for it was not well planned. It has since been extensively altered by the owners and successfully does the work desired, but it requires too much labor. Including the pickers from 12 to 15 men are employed. As the washer was originally built it had a poorly arranged flow sheet, but this has been much improved. The owners of the plant are fully aware of the defects in the concentrator, but it was the first of its kind, and experience was lacking to show how a plant for the purpose ought to be built. As the life of the stripping will not exceed five or six years, it is not long enough to warrant an extensive remodeling of the washer, in the construction of which about \$25,000 was expended.

The treatment consists simply of crushing and jiggling. The material, which is in lumps ranging up to 3 or 4 in. thick and perhaps a foot in greatest width, is fed from a hopper-bottom car to a bin and from this to a Blake crusher set to a 1½-in. opening. From this the ground material goes to a chain elevator, which carries it to a revolving screen having 1½-in. holes. The oversize of this screen goes to a disintegrating screen in which adhering coal is broken from the lumps of pyrite, while a spray of water washes the fine coal and pyrite through the screen.

The disintegrating screen is a trommel with a perforated steel jacket that has longitudinal flights on the inside. As the screen revolves, these flights pick up the material and drop it and disintegration results. Were the flights not provided, the pyrite would slide and not fall as the trommel revolved. As there is nothing to be removed from the pyrite but a little adhering coal, no great grinding action is necessary. The coal broken off, and unfortunately some pyrite also, goes through the screen, while the clean, coarse pyrite goes over.

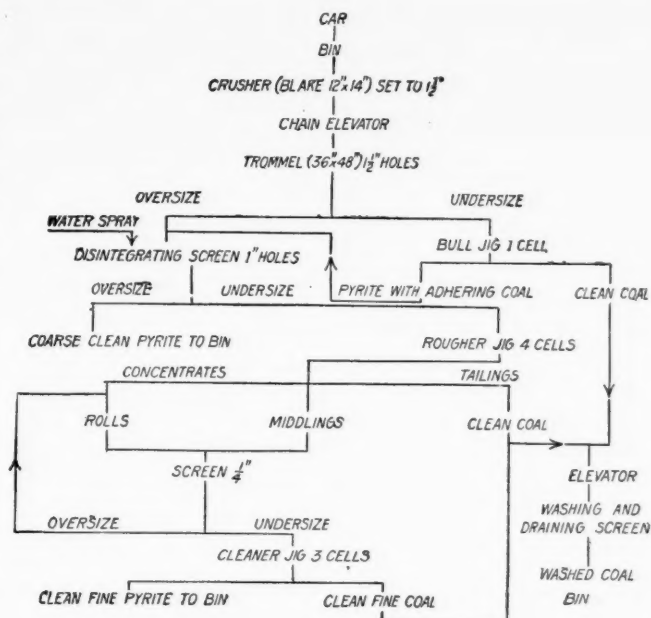
Naturally, it is only the most solid lumps of pyrite that resist the action of the crusher sufficiently to constitute the oversize of the trommel, and the only cleaning needed is the removal of the coal adhering to the surface. This is well done by abrasion in the disintegrating screen, and its product is clean large pyrite, or spalls, and fine fragments of pyrite and coal that constitute the undersize and go to the rougher jig.

The undersize of the main trommel, consisting of everything passing through a 1½-in. opening, goes to the bull jig. This makes two products—clean coal and concentrates consisting of pyrite with adhering coal. The concentrates are like the oversize of the first trommel in everything but size and, as they require the same treatment, they are sent to the disintegrating screen. Evidently the only service of the bull jig is to remove clean coal from a part of the material fed to the disintegrating screen, and it would seem that it might be dispensed with, adding a second disintegrating screen in parallel with the first, if necessary, to take care of the extra load; but the need for this is doubtful.

The rougher jig, which has four cells, makes only two products, as all the concentrates go together to a cleaner jig. The coarse concentrates, however, go first to rolls and then to a screen with ¼-in. holes, being joined at the screen by the fine concentrates. The oversize goes back to the rolls, so that everything is eventually reduced

to ¼ in. and under. This material goes to a cleaner jig of three cells which makes two products—clean fine pyrite and clean coal. The tailings of the rougher jig are also clean coal. The clean coal from the three jigs is taken to a trommel, where adhering pyrite dust is washed off. It then goes to the coal bin.

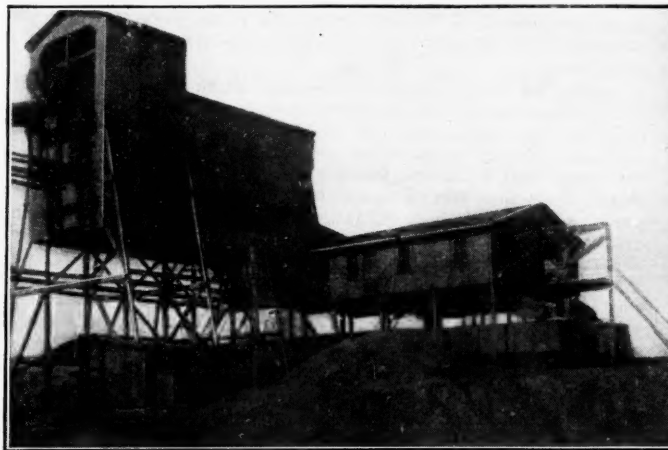
Power for the plant is furnished by three induction motors, one of 75 hp., one of 25 hp. and one of 15 hp., while another 25-hp. motor is used to pump water from the river.



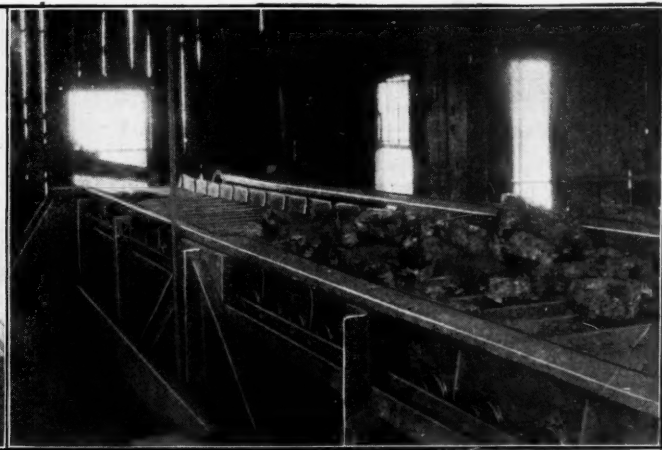
FLOW SHEET OF PROCESS OF CLEANING PYRITE

The company recognizes the fact that the plant could be remodeled so that it could be operated with less labor and power and at the same time with a considerable improvement in the recovery, but does not feel warranted in increasing its investment in view of the low price of its product and the short remaining life of the property. It does hope, however, that there may be a sufficient realization of the merits of pyrite from coal to warrant the cleaning of pyrite at other points, where more efficient washeries could be erected.

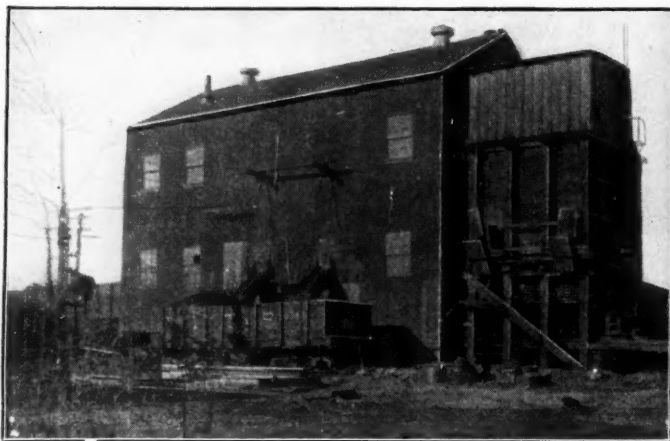
The average production of the washery is twenty-five 40-ton cars of pyrite per month, with about one 25-ton car of coal for each car of pyrite. The income is commonly about \$160 per day, the pyrite being worth about



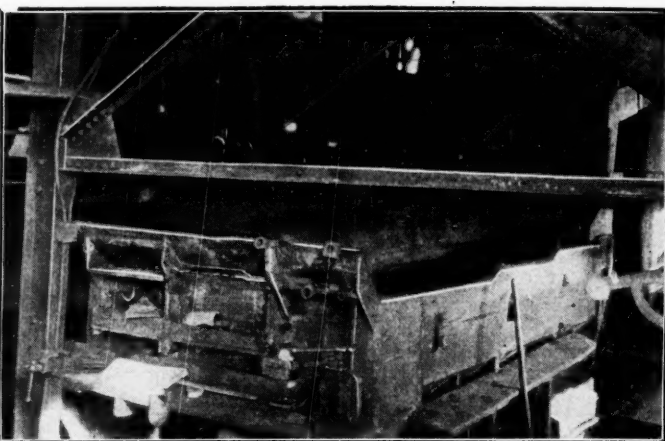
TIPPLE AT WHICH CLEAN COAL IS LOADED



PICKING TABLE WHERE PYRITE IS SAVED



EXTERIOR VIEW OF TWO RIVERS PYRITE WASHERY



ONE OF THE JIGS FOR CLEANING THE PYRITE

\$140 and the coal about \$20. The maximum income is about \$200 per day. There are few idle days at the strippings and the gross yearly income from the pyrite washery is about \$60,000.

The carbon content of the cleaned pyrite is less than 1 per cent. The guaranteed sulphur content is 47 per cent. and an average percentage of that figure is maintained. The coarse pyrite contains 45 to 46 per cent. sulphur and the fines 45 to 48 per cent. It contains on the average 3.5 per cent. water. Neither arsenic nor antimony is present. The only apparent disadvantage in the use of this pyrite is the presence of the small amount of carbon that it contains, and this has largely disappeared with improvements in the methods in use. There is a great advantage in the fact that this pyrite from coal burns more freely than pyrite from other sources, and it is therefore possible with the same equipment to produce more acid per day from this pyrite than from the imported article.

At the beginning, there were some 4,000,000 tons of coal at this place available for stripping, from which about 200,000 tons of pyrite would be picked. The future life of the operation, from the present time, will be five or six years. The company finds that its investment in the pyrite washer, considered alone, has not been highly profitable, but that it will just about pay for itself. It has, however, paid for the cleaning of the coal and thus has increased the price of that fuel; so that, on the whole, the venture has been somewhat profitable. It would not be right to encourage other companies to enter the field under existing conditions, because the present demand for this pyrite is satisfied by the supply and any increase of production would lead to a decrease in the price, which would at once wipe out all profit. There are some places where the pyrite separates cleanly from the coal, for example the Beach Flats stripping in Ohio, operated by the same interests, and there is no reason why pyrite from such sources should not profitably enter the market.

There is needed, then, for the encouragement of coal operators in saving pyrite, a more active demand for the product. This can come apparently only in two ways. First, a better appreciation on the part of makers of sulphuric acid of the advantages or even of the possibility of the use of this material. At present the great bulk of the sulphuric acid made east of the Mississippi comes from the sulphur of zinc blende, and the acid is an important byproduct of zinc smelting. The principal users

of pyrite from coal are manufacturers of fertilizers who use the acid in their own plants. However, there is also one large manufacturer of chemicals who uses it to some extent. Manufacturers who need the acid but do not regard it as a main object, are naturally inclined to follow customary methods, and pyrite from coal is something new. Some of them use it and like it, but not enough to call for a much larger production. This pyrite seems to be fully as satisfactory to those who use it as imported pyrite, and if more manufacturers of acid would use it, that product would cost them less than it does now.

The second possible cause for an increased demand for this material is a decrease in the supply of foreign material or an increase in its price. There seems to be no prospect of any decrease of the supply, and an increase of price is not likely to come without a protective tariff. The advisability of this is something for serious consideration, but it is certainly desirable that coal producers should be encouraged to make some use of the immense quantities of a usable substance which is now, in most cases, wasted.

The Specifications that Were Used by the United States Government for the purchase of coal prior to the fiscal year 1912-13 were on the B.t.u. (British thermal unit) "as received" basis; that is, payment for delivered coal was directly affected by the moisture content of the sample received by the laboratory. This method was based on the assumption that the moisture in the samples collected at the time of weighing and delivery could be preserved with slight loss during the storing and subsequent working down of the gross sample to a quantity convenient for transmittal to the laboratory and in its later treatment in the laboratory. From experiments that have been made and from a large mass of data, it is known that the moisture content of coal does not remain constant, and that the moisture content reported by the laboratory may be as much as 5 to 10 per cent. lower than that actually contained in excessively wet or high-moisture coal at the time of weighing.

Twice as Much Ash in Screenings as in Lump Coal—From a large number of analyses the Department of Applied Chemistry at the University of Illinois determined that, on the average, Illinois screenings contained twice as much ash as the lump coal from the same mine. Much of the roof, "draw slate" floor and bands, which comprise the bulk of the impurities mined with the coal, either break into small pieces or tend to soften quickly on exposure to the air. Any piece of such impurity smaller than 1½ in. in diameter passes into the screenings during the sizing process. Since the impurities are small and pass quickly from sight through the screens, and since they mix with the dust and multitude of small pieces of coal which make up the screenings, they so blend with the prevailing black that close inspection is impossible. It is sometimes easier when loading to break a piece of flat slate with the back of a shovel, so that the pieces will enter the screenings, than it is to pick this same piece out of the coal and throw it in the gob.—E. A. Holbrook in "Dry Preparation of Bituminous Coal at Illinois Mines."

Selecting a Tipple Location

By H. D. EASTON*

In the fall of 1915 I visited the Elliott Branch operation of the Continental Coal Corporation (now Federal Coal Co.) in Bell County, Kentucky, and found the railroad tracks laid for a new tipple. Upon my recom-

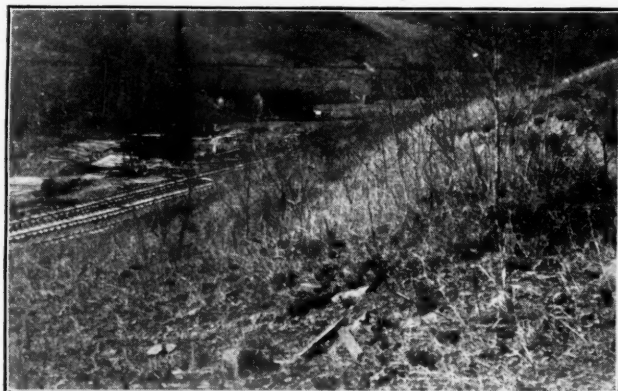


FIG. 1. THE BREAK EXTENDED FAR UP THE HILLSIDE



FIG. 2. CLOSE VIEW OF THE BREAK

mendation the site for that tipple was abandoned because the toe of the hill had been cut away to a considerable depth, thus providing favorable conditions for a hillside slide that would ruin both tracks and tipple.

The accompanying photographs, taken in the early spring of 1916, show what actually happened and they

president of the executive committee, the other officers being Charles D. Walcott, Samuel Gompers, Hennen Jennings, John A. Brashear, and David T. Day, secretary.

The following method of recognizing the services of Mr. Holmes has been formulated:

1. Annually one or more medals, with honorariums, will be awarded, to be known as The Holmes Award for the encouragement of those originating, developing and installing the most efficient safety-first devices, appliances or methods in the mineral industry during the previous year. These awards to be the result of reports and investigations by the secretary and the representatives of the association.

2. Once a year a meeting will be held in the City of Washington, at which these awards will be made and to which the recipients will be invited, the awards being announced publicly at a dinner or meeting which may be held at the time of the annual meeting of the representatives of the societies making up this association.

3. The executive committee, at its discretion, may make awards of suitable medals for personal heroism or distinguished service or the saving of life in any branch of the mineral industry, such medals being of small intrinsic value, but suitably inscribed with the name of the recipient and the nature of his service.

These medals are to be presented publicly, with appropriate ceremonies, through the medium of the field representatives of the Bureau of Mines or other suitable agency at the mining camp, town, village or city nearest the mine, smelter or other establishment in which the act of heroism or service was performed.

Contributions in any amount may be sent to David T. Day, secretary, Joseph A. Holmes Safety Association,



FIG. 3. HILLSIDE WAS BROKEN AND RAILROAD TRACKS HEAVED UP

prove that the tipple would have been wrecked shortly after completion had that location been used. Fig. 3 gives a general view showing the railroad tracks heaved up and the hillside broken. Fig. 1 shows how far up the hillside the break extended and the enormous amount of loose material that would have had to be dealt with. Fig. 2 is a close view of the break far up the hillside.

It is especially true in eastern Kentucky that slides can be caused by cutting away the toe of a hill, and any construction work should be so planned as to avoid this difficulty.

The Joseph A. Holmes Safety Association

The Joseph A. Holmes Safety Association has been formed to keep in memory by some appropriate remembrance the public work of the first director of the United States Bureau of Mines, Joseph A. Holmes, who died July 13, 1915. Van H. Manning, his successor, is the

*General superintendent, Federal Coal Co., Straight Creek, Ky.

1333 F St., N. W., Washington, D. C. All drafts and money orders should be made payable to the Washington Loan and Trust Co., treasurer.

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Among the Coalmen Who Attended the Dinner of the Pennsylvania Society at the Waldorf-Astoria on Dec. 9 were: M. S. Kemmerer and J. L. Kemmerer, of the Whitney & Kemmerer forces; E. J. Berwind; J. F. Birmingham; J. O. Clark; John C. Cosgrove, of Johnstown; Samuel D. Warriner, Edwin Ludlow, Richard T. Davies, Harry F. Baker and Lewis A. Riley, of the Lehigh Coal and Navigation Co.; Alva C. Dinkey, of the Cambria Steel Co.; William T. Grier, of the Lehigh Valley Railroad Co.; R. A. Hatfield, of Hatfield & Hilles; Samuel Heilner; Robert J. Montgomery and Frank Oberender, of the P. & R. Coal and Iron Co.; S. B. Thorne, of Thorne, Neale & Co.; W. H. Truesdale, of the Delaware, Lackawanna & Western Railroad Co.; F. D. Underwood, of the Erie Railroad Co.; W. J. Richards, of the Reading; E. J. Skeele and Frank J. Honan, of the Skeele Coal Co.; D. Anthony, of the Lehigh & Wilkes-Barre Coal Co.; Richard Peters, of Williams & Peters; John Markle; Telford Lewis, of the Knickerbocker Fuel Co.; M. F. Burns, of Burns Bros.; M. Tracy; L. F. Loree, Delaware & Hudson Co.; H. H. Ashley, of Parrish, Phillips & Co.; Gardner Pattison, of Pattison & Bowns; Charles Dorrance, Jr., of Pottsville; Charles H. Zehnder, of the Austin Coal and Coke Co.; Robert A. Quin, Maj.-Gen. C. Bow Dougherty of the Susquehanna Coal Co.; and Charles F. Huber, of the Lehigh and Wilkes-Barre Coal Co.

Use of Permissible Explosives*

SYNOPSIS—The following interesting discussion regarding the present practice in the different states and Canada, in respect to the use of permissible powders, took place at the Joplin meeting of the Mine Inspectors' Institute of the United States of America and was published in the Institute proceedings for 1916. It is interesting as showing the progress made by the Federal Bureau of Mines in the introduction of "permissibles" in the states. The discussion was opened by Charles H. Nesbitt, chief mine inspector of Alabama, at the request of the president of the Institute.

MR. NESBITT (Alabama)—I did not come prepared to make a lengthy talk. In fact, I can only speak from a practical experience gained in the past five or six years, since assuming the office of chief inspector. I am unable to say just when the use of permissibles started in Alabama. It was probably seven or eight years ago. Since that time it has increased gradually, year by year.

We have recently compiled tables showing the percentage of permissibles used in the different counties of the state for the last two years, on a tonnage basis. For the year 1913, for the entire state, I believe we used 68 per cent. permissibles and 32 per cent. black powder, and about the same for the years 1914 and 1915.

The Alabama field is divided into four different groups: The "Warrior field," which is the Birmingham district proper, is hard coking coal; the "Cahaba field," which is hard domestic coal, and the "Coosa" and "Plateau" fields.

In the Cahaba field, it is purely a commercial proposition. Many of the operators claim they have never been able to get a permissible explosive that would not give a considerable percentage of lump coal. All the coal in this field is washed and culled and they do not care to produce lump coal.

In Jefferson County, which is the largest producer in the state, the proportion runs about 90 per cent. permissible and 10 per cent. black powder; and in Tuscaloosa, where the coal is a coking coal, it runs about 95 per cent. permissible. Some permissibles are used in the Cahaba field in drifting.

In the Warrior field, which comprises the counties of Walker, Winston and Cullman, permissibles are used to some extent; but, as they have long been in the habit of using black powder, it is hard to induce the miners to use permissibles. The operators claim they would use them if there were no objections on the part of the miners.

We feel that the use of permissible explosives in our state has been a great saving and a large factor in mine safety. We have some mines that are dangerous and must be watched all the time. They are gaseous and contain considerable dust. To use black powder in these mines would be extremely dangerous. This is well known both to the miners and operators and I do not believe they could be induced to go back to black powder. We have some records of blownout shots, that occurred several years ago, caused by the use of black powder and which resulted very disastrously. Then, we have had a

number of local accidents where men would ignite a keg of powder in making up shots with open lights. In the use of permissibles this, of course, is eliminated.

There is one thing that is hard to regulate in permissibles and that is, the proper charging of the holes. I have known of cases where men wanted to use seven or eight sticks, while the Bureau of Mines specifies something like four sticks to a charge. In many instances that amount is exceeded. On the whole, everything is working out very satisfactorily and I feel it has been a great saving to us.

MR. BACK (Illinois)—You say that they use as high as 90 per cent. of permissible explosives. I would like to ask if that is in blasting down solids. Because, I have been in mines all my life and have always used black powder. I have considered permissibles not good to use in blasting out solids, as they do not give the same efficiency.

MR. NESBITT—Permissibles are used in solid blasting in Tuscaloosa and Jefferson Counties.

MR. SCOLLARD (Indiana)—About what is the amount specified for a blast and what would be its equivalent in black powder?

MR. NESBITT—Four sticks is the usual charge of permissibles, which would be equal to about two pounds of black powder.

MR. SCOLLARD—There is a law in our state that forbids a miner to use more than six pounds of black powder, but they sometimes use eight.

MR. FLYNN (Alabama)—The company I work for use permissibles wherever practicable. We use it in the Pratt field, where the coal is all undercut by machines. Two sticks of powder is their maximum charge limit. In the Blockton field we have a maximum charge limit of three sticks. The coal there is a domestic coal, and we have tried every brand of permissible in that seam, but found none that will give results. The reason is that it is a hard, firm coal and the permissible powder is too quick in its action.

We never allow a man to take more than five pounds of powder into the mine at any time. We have a "Powder Jack" system and use a can with a screw top. These cans are turned in at the Jack House each night and filled with powder. The penalty for violating this rule is discharge, and no excuses are taken at all. Mr. Scollard's statement that, in Indiana, they have a law that permits a man to use 6 lb. of powder in one shot amused me. In Alabama we have a law that says the charge of powder shall in no case exceed one-half the length of the hole. If the hole is three feet in length, there cannot be over 18 in. of powder charged in that hole. In some of our mines we permit the men to shoot when they please, and after becoming accustomed to the system they prefer to fire the small shots rather than the heavy ones, as they find they can break the coal better and get a larger tonnage.

Personally, I believe that black powder can be used in coal mines just as safely as permissibles, under proper regulation. The only reason I advocate the use of permissibles is, that an accident is not so likely to occur with the careless use of permissibles as with the careless use of black powder. It is the careless use of these explosives that causes accidents.

*Extract of Proceedings of Mine Inspectors' Institute, U. S. A., 1916.

MR. BACK—We also have a law in Illinois that limits the amount of powder charged in a single hole, but in some places they exceed the limit of the law, yet you cannot catch them at it. A charge of 50 or 60 in. is the limit in our high seams. I think there are places, however, where they get about two shots out of a keg of powder.

MR. SCOLLARD—Mr. Flynn is certainly fortunate in having men he can control. In Indiana we think we are lucky if we can enforce the law. For instance, an operator will take no interest whatever in ascertaining how much powder is used in a hole. The more powder he sells the better he is satisfied. We need a law to regulate the amount of powder that a man can take into the mine. At times a man will take in two kegs at once, when they are working as "buddies," and it is hard to keep them from overloading their holes.

Some time ago, I filed a suit against parties owing to a man being injured by shots they had fired while he was working in the mine. I am sorry to say the miners' organization hired an attorney to defend the parties firing the shots and they won the case. The grounds on which I filed suit were based on a clause in the mining law that gives the inspector power to recommend safety measures other than those prescribed in the statute; but the court dismissed the case, because no penalty was prescribed in the act.

MR. FLYNN—The charge limits I mentioned are fixed by the rules of the company, the officials and the mine inspectors. If these rules are violated promiscuously the mine foreman, his assistants or the underground safety inspectors may lose their job. Of course, the mine inspectors could not enforce these rules without the coöperation of the company.

MR. GRAHAM (*British Columbia*)—In the coal mines of British Columbia, we are using permissible explosives exclusively. No black powder has been used in the coal mines of the province during the past twelve years. Prior to 1913 all coal was produced by a low-grade dynamite. In 1913, a permitted list was published and all mines worked with safety lamps must use permissible explosives under that list. In 1915, a new permitted list was issued, and now nothing but permissible explosives are used in any coal mine of any character, in British Columbia. No person is permitted to take more than four pounds of powder into a mine at one time and all shotholes are examined, tamped and fired by a competent certificated shotlighter.

I think that, during the year 1915, the average amount of powder used per shot, in the coal mines of our province, was slightly under one-half pound.

MR. NESBITT—I want to correct the statement I made a few moments ago that in some instances 2 lb. of permissible explosives was the charge in some districts in Alabama. If I remember rightly, the charge limit on all permitted explosives, prescribed by the Bureau of Mines, is 1½ lb. I believe that the minute you exceed the charge limit of a permissible explosive, it ceases to be a "permissible explosive."

MR. GRAHAM—In British Columbia the charge limit varies, I think, in some instances from 10 to 28 oz. Permissible explosives are used in all rockwork.

I cannot indorse the statement made by Mr. Flynn to the effect that if black powder is properly handled it is as safe as permissible explosives. In my opinion, to accept that statement would be to disregard the investigations

that have been conducted, both in the United States and Great Britain. In every instance where research work has been in progress, it has been found that black powder is the dangerous element in coal mines. I believe the day is not far distant when no black powder will be permitted in any coal mine, both in Europe and in this country. If the researches of our various governments in respect to the use of explosives are to be of value to the mining industry, then we as inspectors and men imbued with the idea of safety must endeavor to promote the use of permissible explosives.

MR. FLYNN—Replying to Mr. Graham's comments on research work and experiments in respect to the use of black powder and permissible explosives, the conditions have always been made such as to produce the desired results in those tests. For instance, to show the effect of black powder on coal dust in a very dusty colliery, the necessary amount of dust is arranged in the gallery and a charge of black powder fired into it, which we know will ignite the dust. In other words, the conditions are made ideal for the test intended.

I concur with Mr. Graham in regard to the superior safety of permissibles as shown, where the conditions are arranged with the intention of making an explosion with one powder, when it will not occur with the other. If you give black powder the chance to break the coal, it will perform its work safely when the proper charge is used. I am not discussing safety-lamp mines, because we have none such in Alabama. All our mines are open-light mines, and in those mines I am sure that black powder can be used with as much safety as permissibles.

In the Blockton field, we use black powder, although it is a dangerous operation, owing to the faulty roof; but we have fewer accidents there than in any other field. We have not had, in that group of mines, what is known as a "windy" or "blownout" shot. For that reason, I made the statement I did, that under proper regulations and proper charge limit black powder can be used with as much safety as permissible powder.

Where permissibles are used in blasting the roof we have more falls of rock and the roof cuts higher than where black powder is used. If I were operating a mine myself in the Birmingham district or in the Blockton district, not a pound of permissibles would be used. In the Blockton field, where we have used permissible powder, the powder cut up into the rock as far as it could break. Then, the air gets in and the rock begins to dry out and fall; which gives us any amount of trouble. We could go into headings, in this field, where rock had been blasted by black powder before permissibles were introduced, and it was just as firm as ever. So that I am forced to conclude that permissible explosives have their disadvantages as well as advantages. In my opinion, the chief object in using permissibles is to prevent explosions of gas and dust. I regard them more dangerous in our mines than black powder, because they affect the roof, the explosion being more violent.

MR. GRAHAM—In respect to the question of safety between the two explosives, I am pleased to know Mr. Flynn has conceded the point that, under similar conditions, even though prepared for the purpose of demonstration, black powder will ignite gas and dust where permissibles will not, and I am satisfied to let it rest there and say that permissible explosives are the safer of the two for mine use.

Power Department

Pulverized Coal as a Power-House Fuel

BY REGINALD TRAUTSCHOLD*

SYNOPSIS—Although pulverized coal can be successfully employed as a metallurgical fuel its use for power generation has been fraught with many difficulties. Smokeless combustion, increased boiler efficiency and ease of control are readily attained. Present experience would indicate, however, that the employment of this fuel is not economically justifiable unless coal is at least fairly expensive.

The use of pulverized coal in connection with metallurgical processes dates back some 85 years, it having been successfully used in England for blast furnaces in 1831; but as a power-house fuel its use, or attempted use, covers a period of only about 30 years, and its successful adoption as a fuel under boilers, if a commercial success can yet be claimed, is a question of but a comparatively few years—not more than ten at the outside.

Smokeless combustion, increased boiler efficiency, ease of control and economy are the results anticipated if pulverized coal can be successfully used as a power-house fuel. There is no question that all but the last of these results can and will be realized, for they have already been

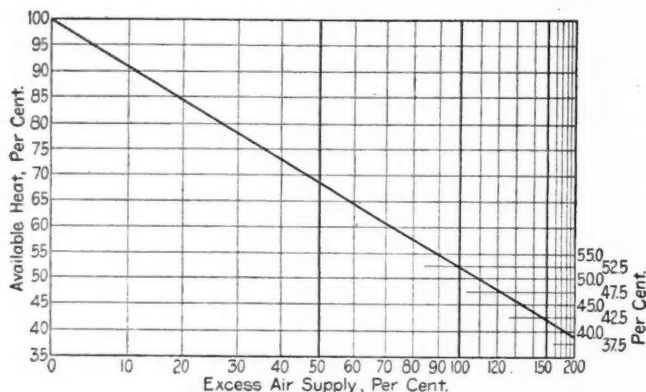


FIG. 1. EFFECT OF EXCESS AIR ON THE HEATING POWER OF BOILER FUEL

attained by the use of liquid fuels. It is, however, upon the ability to realize the last-named advantage—economy—that the commercially successful adoption of pulverized coal as a power-house fuel must depend. Scientifically interesting as are the other advantages, the realization of which there is no reason to doubt, they carry little weight unless economy can also be secured.

Economy can only be attained through the absorption of a greater proportion of the heating value of the coal by the boiler contents at an expense proportionally less than the resulting increase in boiler efficiency; that is, the value of the increased efficiency must be greater than the expense in securing it, else no benefit is realized.

The amount of heat which the boiler contents will absorb is directly proportional to the difference in temperature within and without the boiler, so that increased efficiency in a boiler of any given design and size can only be secured through an elevation in the temperature of the products of combustion as they leave the combustion chamber of the furnace.

Ignoring, for the time being, the difficulties incident to the maintenance of a high temperature in the furnace, it is a simple matter to calculate the temperatures which could be secured under definite conditions. A pound of coal requires approximately 15 lb. of air for its complete combustion, and the specific heat of the products of combustion average very close to 0.25, so that the attainable Fahrenheit temperature of the furnace under ideal conditions is measured by approximately one-quarter of the heating value of the coal expressed in B.t.u. per lb. The attainable furnace temperatures when burning a coal averaging 12,000 B.t.u. per lb. is then 3,000 deg. F.; for a coal of 13,000 B.t.u. heating value, 3,250 deg. F.; and for a rich coal containing 14,000 B.t.u. per lb., the highest furnace temperature would be in the neighborhood of 3,500 deg. F.

The foregoing temperatures could only be attained through perfect combustion without excess of air supply, or heat losses of any description. A temperature of 3,500 deg. F. may then be taken as fixing the maximum for the furnace when burning high-grade coal. As coal can only successfully be burned without excess air supply when in the form of fine dust, 3,500 deg. F. is also the limiting temperature when burning pulverized coal of any but exceptionally high heating value.

Complete combustion of commercial sizes of coal cannot be realized in any type of boiler furnace without an excess air supply, the best results being secured when an excess of about 20 per cent. is admitted. The effect of surplus air is to reduce the furnace temperature, the rate of decrease rising rapidly with the increase in the excess admitted. Fig. 1 diagrammatically depicts the law of decrease and shows that with an excess air supply of 20 per cent., the available heat would be but 84.5 per cent. of the thermal content of the coal.

Theoretically then, the highest furnace temperature which could be maintained with a fuel of 14,000 B.t.u. per lb., consumed in any commercial size, would be 2,957.5 deg. F. Actually, the attainable temperature would be quite appreciably less, since part of the heating value of the coal would be consumed in the energy required to break up the fuel so that the air could come in intimate contact with its combustible contents. There are always, also, a number of heat losses which cannot be entirely avoided, so that 2,500 deg. F. is about the highest temperature which can be maintained in a well-designed and proportioned boiler under which coal is burned in any of the commercial sizes.

Of just as great importance as the temperature maintained in the furnace is the temperature at which the products of combustion leave the boiler passages for the

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breeching. The difference in temperature of the gases first coming in contact with the boiler heating surface and that at which they escape from the boiler measures the amount of heat transmitted to the boiler contents, ignoring the comparatively trivial losses in a well-constructed boiler during the passage of the products of combustion through it. This temperature of the escaping gases, when burning coal of commercial size, cannot be reduced much under 500 deg. F. and still maintain the rates of combustion demanded by requirements for steam in the average power house. A higher escape temperature when burning pulverized coal would mean the loss of valuable heat, and any lower escape temperature is just as much out of the question as when burning the coal in commercial sizes.

With a furnace temperature of 2,500 deg. F. and a breaching temperature of 500 deg. F., temperatures which

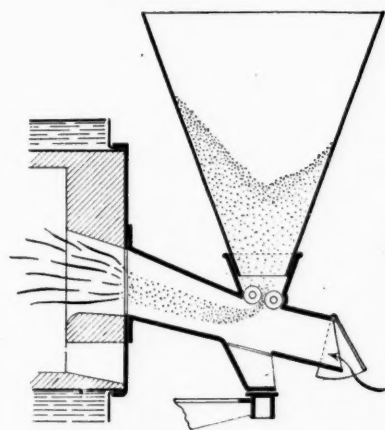


FIG. 2. PINTHER ARRANGEMENT FOR PULVERIZED FUEL

have been realized in efficiently operated boilers under which coal of ordinary size is used for fuel, the transfer of heat to the boiler contents, neglecting leakage and radiation losses, would be measured by a drop in temperature of the products of combustion of 2,000 deg. F. With the respective furnace and escape temperatures at 3,500 and 500 deg. F.—the limiting temperatures should pulverized coal be used, as the fuel—the transfer of heat would be measured by a drop in temperature of 3,000 deg. F., a gain of 50 per cent.

Since the rate of heat transfer to the boiler contents varies with the difference in absolute temperature within and without the boiler, the transfer of heat would not be simply 50 per cent. greater, when burning pulverized coal, as would be the case if the transfer of heat was proportional to the mean temperatures of the gases in contact with the boiler heating surfaces, but about 80 per cent. greater. At least, such would be the respective results were it possible to maintain the same rate of combustion when burning pulverized coal as when burning coal on the grates in commercial size, the temperatures of the escaping gases being 500 deg. F. in either case.

The volume of the escaping gases is dependent upon their absolute temperatures, so that the gases with a mean temperature of 1,500 deg. F. have a volume nearly 50 per cent. greater than those of a mean temperature of 1,000 deg. F. Therefore, with a fixed temperature for the stack gases, the proportional quantity of fuel consumed in the case in which the temperature of the furnace is maintained at 3,500 deg. F. must be but two-thirds as great as when the excess air supply prevents a temperature higher than 2,500 deg. F. being realized. Instead of the gain in heat transfer being 80 per cent. when burning pulverized coal, therefore, it would be but 20 per cent. ($180 \div 150 = 1.2$) in boilers of the same size.

This gain of 20 per cent. would be realized, however, with the consumption of but two-thirds the amount of

coal required for the boiler employing coal of commercial size. Burning the same amount of coal in pulverized form and realizing the full 80 per cent. increase in transfer of heat, would necessitate the use of a boiler designed for 50 per cent. greater capacity. Though this might not entail any increase in the operating expense, it would materially increase the "overhead," the larger boiler of standard design costing, on the average, approximately 30 per cent. more than the standard boiler of a capacity permitting the efficient consumption of the same amount of coal in commercial size.

A gain of 20 per cent. in steam output with a consumption of but two-thirds the amount of coal would then definitely measure the maximum gain in economy that it would be possible to attain through the successful complete combustion of pulverized coal, without excess air supply, under boilers for the generation of steam; such economy being the capacity under ideal conditions. A gain of 20 per cent. in steam output would be equivalent to a realization of a boiler efficiency of 84 per cent. This assumes that the 70 per cent. boiler efficiency that has been realized in economic installations of boilers upon whose grates coal in commercial size was burned measures the best that can be done with efficient boilers of the best modern construction when operated with coal of the usual grade.

In connection with the question of increased boiler efficiency, possible through the use of pulverized coal as fuel, it is interesting to note that a boiler efficiency of nearly 84 per cent. has actually been realized with a specially constructed boiler of particular design, using powdered coal as fuel. Not only does this confirm the deductions advanced as indicating the economy which could be realized through the complete combustion of coal without excess air supply, but it also shows that the successful burning of

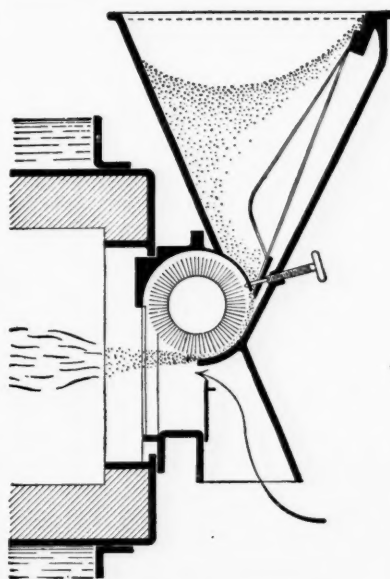


FIG. 3. SCHWART ARRANGEMENT FOR PULVERIZED COAL

coal in pulverized form and without excess air supply can be realized. The major economy which would be attained through the successful burning of pulverized coal as a power-house fuel would be the saving in actual coal consumed, rather than in the increased boiler efficiency. Even if it were not possible to burn the powdered coal without excess air supply, of an amount sufficient to nullify the possible increased boiler capacity of 20 per cent.,

a saving of one-third in the quantity of coal consumed would represent a desirable gain.

There is no question but that pulverized coal could be burned with an excess air supply which would not reduce the boiler efficiency below that attainable when burning coal of the ordinary commercial sizes. The main consid-

eration, therefore, is how great would be the saving in consumption of coal brought about by pulverization before admitting it to the furnace—a saving of $33\frac{1}{3}$ per cent., or its equivalent, being admittedly impossible.

A pulverizing plant would have to be installed. This would consume coal, entail labor and require a certain supply of power, all of which would be chargeable against the saving in coal consumption in the boiler furnace. The initial cost of such a plant depends largely, of course, upon its elaborateness, the degree of duplication of its equipment, etc. It would have to contain some kind of a dryer, usually a rotary kiln, which consumes power, requires a supply of heat and calls for some amount of attention. The dried coal would then have to be pulverized, after which it would have to be transported, in a plant of any size, by conveyors or elevators to overhead storage and feeding bunkers; all of which consume power and necessitate attention.

An accurate estimate of the cost of these unavoidable preliminary operations and that of the necessary equipment with which they may be economically performed is difficult to make. The costs of the comparatively few installations of pulverizing plants which have been installed and operated vary considerably, even in plants of about the same capacity. A conservative average may be arrived at, however, for the cost of the individual operations. These are given in Table 1, expressed in terms of percentage of an equivalent amount of coal necessary for pulverizing one ton of coal of commercial size.

TABLE 1. AVERAGE COST OF PULVERIZING PLANT EXPRESSED IN TERMS OF COAL EQUIVALENT

Expense	Coal Percentage
Equipment:	
Overhead—fixed burden.....	6.00
Depreciation.....	7.25
Drying Coal:	
Fuel.....	2.50
Power.....	1.25
Attendance.....	2.00
Pulverizing Coal:	
Power.....	15.60
Attendance.....	5.00
Conveying Coal:	
Power.....	2.00
Attendance.....	2.00
Total (cost in coal of the coal pulverized) per cent.....	43.00

The foregoing percentages are figured on an average valuation of \$3 per ton for power-house coal. The labor charges and burdens would, of course, be proportionally less for more expensive coals. The fuel consumption when drying coal, the power consumption, etc., is figured on the basis of reducing the average water content of a high-grade coal to not more than 1 per cent. For poorer grades of coal, this expense would probably be increased.

THE COAL MUST BE DRY

Dry coal is a requisite not only for securing high efficiency in combustion, but also for minimizing the amount of power required for pulverization. A coal which contains considerable moisture is much more difficult to pulverize than one which is comparatively dry. A fine dry powder which can be easily fed to the furnace without an excess of air is an important consideration, for coal with a moisture content of but slightly more than $2\frac{1}{2}$ per cent. crushes into a pasty mass difficult to handle.

Pulverization should be carried to such a point that practically all the coal will pass through a screen having 100 meshes to the inch, and the larger proportion through a mesh of 200 per inch.

The transporting, conveying and elevating of pulverized coal can be most economically performed with the

aid of screw conveyors and inclosed bucket elevators. This is a comparatively inexpensive operation.

The net cost of pulverizing a ton of coal (see Table 1) is equivalent to the consumption of about 43 per cent. of a ton of coal valued at \$3 per ton. This represents in part the coal actually required for fuel consumed by the dryer and for the generation of power. The balance is the average value of other expenses expressed in terms of an equivalent quantity of coal valued at \$3 per ton. A ton of pulverized coal then represents about 1.43 tons of coal as received at the power plant.

Since two-thirds of a ton of pulverized coal is theoretically the equivalent, in heating value, for power-house purposes, of a ton of ordinary commercial coal, this means that the economy in fuel consumption represented by the one-third of a ton saved in the boiler furnace is practically wiped out by the cost of preparing the crushed coal ($\frac{2}{3} \times 1.43 = 0.954$). This is practically so if the value of the coal is \$3 per ton and will be exceeded should its value be less.

The economic gain made possible through the use of pulverized coal as a power-house fuel is thus limited to the increased boiler efficiency secured by its use, unless the price of coal is exceptionally high. This in itself would represent a considerable saving, possibly 20 per cent., if it could be secured without entailing unwarranted expense.

Complete combustion without excess air supply being the requisite for securing the highest furnace temperature, regulation of the respective coal and air supplies is of the utmost importance. About 15 lb. of air, as previously stated, is required for the complete combustion of 1 lb. of coal, and as the relative volumes of equal weights of coal and air are about 1:990, some 14,850 times as much air, in volume, must be furnished as of coal; that is, each particle of coal must be surrounded with a globule of air more than 24 times as great in diameter.

AIR FOR COMBUSTION WILL CARRY FUEL

Pulverized coal, in adequate quantities, can readily be transported into the furnace by a current of moving air of the volume necessary for the complete combustion of the fuel—1 lb. of coal being carried in virtual suspension, provided it is finely enough ground, by 15 lb. of moving air. This facilitates the injection of the coal into the combustion chamber, but at the same time complicates the question of satisfactory draft. A clear incandescence in the furnace, without the precipitation of any unburned coal, is the condition demanded for securing the maximum furnace temperature, and this depends largely upon the intensity of the draft which can be maintained.

The history of the attempts made successfully to burn pulverized coal in boiler furnaces has been largely that of efforts to adapt the process to boilers of the horizontal type. These attempts have been extremely valuable in emphasizing the importance of draft and the necessity of prolonging the usual duration of the passage of the gases through the furnace chamber, in order that sufficient time may be provided for the complete combustion of the fuel while it remains in suspension in the air.

Fig. 2 diagrammatically illustrates the first type of apparatus which gave any promise of successfully burning pulverized coal. The prepared fuel is placed in a steep-sided hopper equipped with a feed-controlling mechanism. From here the coal is fed to the air intake and carried to the furnace by the natural draft created.

Boiler efficiencies of from 75 to 80 per cent. were obtained by this arrangement, but the capacity of the boiler was quite limited. When the draft was sufficient to transport any considerable amount of coal, the velocity of the products of combustion through the furnace was so high that unconsumed particles of coal were carried into the back connections and deposited upon the boiler tubes, resulting in a serious lessening of the boiler efficiency.

The drawbacks of the apparatus depicted in Fig. 2 were overcome to a great extent in the somewhat similar arrangement of equipment shown in Fig. 3. In this latter device, the pulverized coal is fed in greater proportional quantities into the path of the entering air by a rotary brush and carried into the combustion chamber in greater quantities than it was possible to attain with the first apparatus. A thin fire of coal of commercial size was maintained on the grates of the furnace and materially helped to ignite the supply of pulverized fuel.

In this arrangement precipitation of unburned particles of fine coal was not entirely avoided, but was limited to

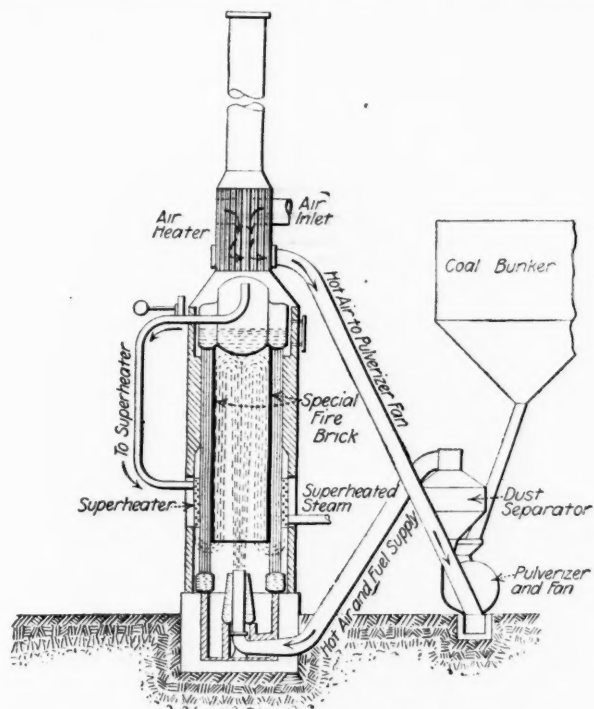


FIG. 4. FURNACE ARRANGEMENT OF THE BETTINGTON BOILER

a settling of the fine coal upon the bed of incandescent fuel, thus keeping the fire on the grates replenished. The furnace chamber was maintained full of clear flame and the chimney was practically smokeless, but the arrangement did not prove practical or economical and never reached a commercial stage.

Subsequent attempts to use pulverized coal as fuel for steam boilers utilized air under a pressure of a few ounces to introduce the fuel into the furnace and various arrangements of counterblasts whereby the direct passage of the products of combustion through the furnace chamber were diverted, the interposition of firebrick baffle walls having proved unfeasible on account of their rapid deterioration by the intense heat of the flame resulting when no cooling excess air is admitted.

Complicating the problem still further and constituting the most troublesome disadvantage encountered in burn-

ing pulverized coal is the formation of ash slag, which is in a more or less liquid state at a temperature of 2,500 deg. F., but which moves but sluggishly at that temperature. At about 1,250 deg. F. this slag solidifies and, in contact with brickwork, necessitates hacking into the boiler settings and otherwise damaging the boiler for its removal.

Special boilers incorporating provisions for avoiding, or at least minimizing, the difficulties encountered in the attempts to adapt boilers of standard design to the use of pulverized coal have been developed. One of the most successful of these is the one designed by Claude Bettington, of Johannesburg, South Africa. This boiler has proved not only highly efficient, but also economical in localities where the price of coal is high; that is, where not only the gain of higher boiler efficiency is realized but where the price of coal is high enough to materially affect the cost of pulverization of fuel, etc.—resulting in a saving through the reduction in coal consumption.

The principles of the Bettington boiler are shown in Fig. 4. The fuel is fed upward through a water-jacketed nozzle in the center of a vertical cylindrical furnace. The blast, which opposes gravity, is supplied by the pulverizer acting as a fan and handles preheated air under a pressure of about 2 in. of water. The blast tends to keep the coal in suspension, and as any particle of coal would have to pass twice the length of the furnace (first upward and then downward around the central flame) before it could leave the furnace chamber, no trouble is encountered through the escape of unconsumed fuel.

THE TUBES ARE PROTECTED

The vertical boiler tubes are protected by walls of a special refractory material, from the upper header to within a short distance of the lower header. These also form the walls of the combustion chamber. The brick are arranged loosely about the boiler tubes, when installed, but soon become coated with molten ash and slag so that they are welded into a solid wall. The central flame never comes in direct contact with the brickwork of the boiler but impinges upon an accumulation of hot gases in the upper end of the furnace chamber. The gases in contact with the vertical walls of the furnace are appreciably cooler than those in the central zone, or core. The radiant heat, however, is effective upon the chamber walls and through them upon the boiler tubes and their contents.

The gases of combustion after passing under the lower edge of the protecting walls of the furnace, rise and circulate about the vertical boiler tubes, the upper header and steam drum, then pass through the air heater and finally escape to the stack (see Fig. 4).

The molten ash which is not deposited upon the furnace walls, or carried out of the boiler by the draft, drops into the ashpit below the lower header where it can be removed with comparative ease and without material damage to the boiler or its setting.

Superheated steam is generated in a superheater encircling the boiler tubes opposite the hottest zone of the combustion chamber. The saturated steam, withdrawn from the upper section of the steam drum, is fed to the upper section of the superheater and withdrawn from its lower section in order to secure the advantages of counter-circulation.

Exhaustive tests of Bettington boilers operating on coal of only average quality have shown boiler efficiencies of

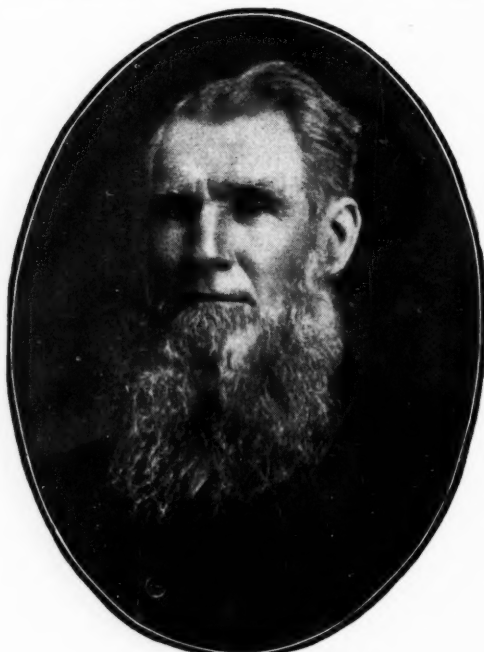
close to 83 per cent.—within 1 per cent. of the best efficiency which can reasonably be hoped for in a boiler employing coal as fuel. These boilers have also been successfully operated at 50 per cent. over rating. The reported life of the special firebrick furnace lining used in this boiler is about two years, and if the heating surfaces are kept reasonably clean and the boiler kept properly supplied with water, the metal parts will withstand the intense heat maintained in the furnace. In fact, the parts that have required most attention and have necessitated most frequent renewals have been the beaters and linings of the pulverizer.

A furnace of the reverberatory type is essential when burning pulverized coal, since this fuel introduced into the furnace at a rate sufficient to develop the capacity of the boiler would remain in the combustion zone less than half a second. This is not sufficient time for complete combustion of all fuel and results in a waste that offsets any gain secured through avoiding the necessity of an excess air supply.

The commercial success of the Bettington boiler is not necessarily assured, but it does appear to be the one arrangement which promises to be a practical success. It has already proved its worth in localities where the price of coal is high. The construction is of particular interest, however, as an example of the successful solution of a hard problem. It well demonstrates the changes and modifications of ordinary boiler design required for the practical burning of pulverized coal. Its commercial success depends upon its cost and whether it can show a sufficient saving in fuel consumption, without unwarranted elevation in the net cost of operation, over the more familiar boiler designs which have proved satisfactory when burning coal of ordinary commercial size.

Henry Mitchell

Henry Mitchell, one of the pioneers in the industrial development of eastern Nova Scotia, died at the age



HENRY MITCHELL

of 91 at his home in Old Bridgeport, N. S., late in November, 1916. Mr. Mitchell was born in England and came to Nova Scotia with his parents at the age of 12.

As early as 1864 he became identified with the coal industry. After years of successful management of the Glace Bay Coal Co., at Glace Bay, N. S., he opened a mine at Old Bridgeport. In 1893 he sold this mine to the Dominion Coal Co. and retired from business. Although well advanced in years, he still took an active part in public affairs and was long a member of the board granting mine officials certificates. It was said that no man knew better than he the qualities necessary to a successful mine boss.

Mr. Mitchell was endowed with a large, strong physique, critical acumen, excellent judgment, warm sympathy, and a marked sense of honor. His energy, industry, integrity and economy often won him success where men of less endowment would have failed.

Opha G. Shomo

Opha G. Shomo was fatally injured in the discharge of his duties as mine foreman for the Gage Coal and Coke Co., at Gage, W. Va., Dec. 9, 1916, dying in a Fairmont hospital the following day. Mr. Shomo was born at Junior, W. Va., in 1884. The death of his father a few years later compelled him to enter the mines while



OPHA G. SHOMO

still a boy. Although thus deprived of most educational advantages, his untiring efforts were fast winning him a place among the self-made men of his state. In August, 1916, he was appointed mine foreman for the Gage Coal and Coke Co., which position he held until his death. He is survived by his widow and two daughters.

A Precipitation of 3 in. of Water on a loaded 50-ton car, area of top about 360 sq.ft., would increase the weight of the coal 5.01 per cent. provided none of the water drained out or evaporated. It is obvious that if this coal is weighed and delivered immediately, special samples for moisture determinations should be collected and prepared at once and sent to the laboratory, as a basis for equitable adjustment of payment on account of the excessive amount of water in the coal. As the weight of the coal was increased by the excess water, there should be a corresponding decrease in the price to be paid.

The Labor Situation

General Labor Review

Cold weather and Christmas have caused a cessation of hostilities here as well as in the European field of war. The miners are ill disposed at this time to replace the high cost of living by the still higher cost of loafing, and for these reasons, as also for a respect for their contract—often broken but not wholly forgotten—the miners have made the present Christmas a time of peaceful operation.

It serves little purpose to keep forecasting the vote for presidents, vice-presidents, secretary-treasurers, board members and auditors, both international and local, for until the official count is completed nothing can be definitely stated. The officials have usually been appealed to for information and their disposition is naturally to state that there has been no change in the offices, the old incumbents being elected. While this is generally the case and is doubtless true as far as John P. White is concerned, there are some changes possible which the present officials did not at first concede.

How the Election Goes in Three Districts

In the second district, for instance, it appears that James Purcell, the president, is dispossessed by John Brophy, of Nanty Glo in Cambria County. Brophy's vote in Cambria and the adjoining counties ran quite high. Charles O'Neill, also of Cambria County, appears to be reelected vice-president and Richard Gilbert, of Clearfield, secretary-treasurer.

It appears that in Illinois Frank Farrington, of Streator, leads James W. Murray, of Westville, his nearest opponent, by almost 10,000 votes. Frank Hefferly, of Collinsville, although he announced his withdrawal, received about 14,000 votes. Walter Nesbit, of Belleville, is about 4000 votes ahead of Duncan McDonald, the incumbent of the secretary-treasurership. His election is regarded as assured. Harry Fishwick, of Springfield, will be vice-president.

John Gay, the secretary of district No. 13, Iowa, has certified to the union the results of the election. In the race for president, J. C. Lewis with 4718 votes leads James F. Moran with 3085½; Charles Masters with 2418½ and John X. Cochran with 1140½ votes. J. H. Morris becomes vice-president with a comfortable majority, having 3347½ votes as against 2452½ obtained by Walter Booth, his nearest opponent. John Gay succeeds himself as secretary-treasurer and Samuel Ballentyne is international board member.

Greenwood Strike Ends After Three Months

The mine workers of the anthracite region in their pursuit of mine legislation for the coming year are not extremely hopeful that they will be successful because of the aid they have rendered Edward X. Cox, of Philadelphia, who was Governor Brumbaugh's choice in the fight for the speakership. There is a fear that the next legislature will be controlled by anti-Brumbaugh members and that these will give the mine workers little consideration, feeling resentment against them for their advocacy of the interests of E. X. Cox.

At the Greenwood colliery of the Delaware and Hudson Co., located at Taylor, a strike of three months' duration came to an end Jan. 2, practically with the New Year. Of 800 strikers 400 voted on Dec. 28 in favor of accepting the substantial concessions offered, and some of the mine workers returned to the mines at once to put the colliery in shape for resumption of work.

The men declared when they struck that the wage schedules paid were not those fixed in the contract. The men apparently were unwilling to rely upon the decision of the board of arbitration specified in their contract. As a result of their strike they were given advances in most grades of work and an adjustment of car rates satisfactory to them was also made. Several minor details yet remain to be settled and these will be adjusted at a meeting between the miners and Superintendent Cadwalader Evans.

At West Hazleton a former secretary of the Cranberry local No. 2339 and a borough councilman is charged with a shortage of \$328 in his union funds. His name is Ignatz Sydle. At Mines Nos. 2 and 5 of the Packer colliery, belonging to the Lehigh Valley Coal Co. and located at Mt. Carmel,

3000 employees went on strike on Dec. 29 because the company refused to pay them during working hours.

The Lehigh & Wilkes-Barre Coal Co., finding itself unable to hire enough door-tenders at its collieries and forced to employ men who are fitted for work which requires more strength and intelligence, has announced an increase in wage to door-tenders above that granted in the April contract. That agreement called for a wage of \$1.21 per day of 8 hours, while the new wage scale will be \$1.37 for the same working day. Boys in the employ of the company for one year or more are to receive \$1.55 per day of 8 hours. The increase will give about 1000 boys an increase of from 7½ to 28 per cent.

In Somerset County the Knickerbocker mine at Hooversville has materially increased its working force and output, in spite of the efforts of the United Mine Workers of America to stop it. The operation will probably be back on a normal working basis shortly after the first of the year.

None of the other mines that have been idle have resumed operations in the past week, and those that resumed recently are working along with about the same force they had a week ago. The two United Mine Workers' organizers that have been working around Myerdale have been away for about a week but returned about the middle of last week. They are not accomplishing anything of late and admit that about all they are doing is drawing their salaries.

Talk of Requesting New Contract Is Dying

In the Pittsburgh, or No. 5, District the agitation of the United Mine Workers of America for an increase in the scale seems to have entirely died away and the end of the year has come without any demand from them and without a strike to secure concessions that would violate their contract. In some quarters such demands and strikes are feared. Some are disposed to regard the whole agitation as a gigantic bluff on the part of the district officers to scare some of the individual operators into making advances or concessions in order to avoid a shutdown, but the bluff, if there was one, failed.

The attempt on the part of some individual mine workers or locals to get fifty locals to sign a petition for a special convention to demand an increase or concession seems to have failed of consummation and in the Pittsburgh district the New Year was ushered in without the immediate prospect of any labor troubles.

The car supply in both the Somerset and Pittsburgh districts has been worse than at any time this winter notwithstanding the Christmas interruption of work at the mines, and some of the railroads have again placed embargoes on coal moving off their rails. For the first time this winter there has been during the past week a slight shortage of river craft for the transportation of coal from the river mines of the Pittsburgh district. The idleness, which furnishes both time and reason for discontent, has not succeeded in this region in producing any appreciable movement for a strike to break the existing contract.

College Students Visit Gloucester Convention

The reader will remember that a meeting was called at Gloucester, Ohio, by the Hocking Valley miners and as a result a state convention was called to discuss wage increases supplementary to those now paid under the contract. It might be interesting to add that at this meeting Professor Simpson, of the Department of Economics in an Ohio university, took his class to the meeting so that the members might become acquainted with the methods, psychology, and aspirations of the mine workers.

In Kansas the old charges against Alexander Howat, against which he successfully defended himself, are again attracting attention, and Howat bids fair to be not only vindicated but compensated for the aspersions cast on him, however innocently the libelous statements may have been uttered. Furthermore it seems likely that Joseph Hazen who slandered him will have to suffer the consequences.

A preliminary hearing of the case against Joseph Hazen was heard last week in the court of a justice of the peace. The present prosecuting attorney, Floyd Jacobs, went out of office on Jan. 1 and so it was planned to leave the prosecution to the new prosecutor, Hunt Moore, who has replaced him.

R. S. Brennan, of the law firm of Walsh, Aylward and Lee, who in Howat's behalf is handling the preliminary details of the case, states that the action will be pushed vigorously. The attorneys for Howat say that they can prove that the money in question, which is acknowledged to have been given by Charles S. Keith to Joseph Hazen, was deposited in a Kansas City bank to the latter's account. They say they can show that a deposit of an exactly similar amount was made to his personal account in a bank at Pittsburg, Kan. Investigation has shown that this deposit was thereafter drawn upon in various amounts to meet his personal expenses. It is said that not one cent ever reached Howat, despite what Hazen testified. It is on these grounds that a perjury charge has been lodged against Hazen.

Two additional civil suits have been filed by Alexander Howat and by Fred W. Holt, the secretary-treasurer of Howat's district, against Joseph Hazen; the Central Coal and Coke Co., Ira G. Fleming, W. J. Jenkins, of the Western Coal Mining Co., C. S. Keith, C. C. Woodson, Edward E. Riley, John Mayer and the Mayer Coal Co. The plaintiffs demand \$50,000 each. This suit is the outgrowth of the former case in which Holt was alleged by Hazen to have received jointly with Howat the money which Hazen declared he paid over at Keith's behest. This case was filed on June 26. It is expected that it will come up for trial in February.

Oklahoma At Last Writes Tentative Contract

The first biennial contract to be negotiated between the United Mine Workers of America and the recently organized Oklahoma Coal Operators' Association has just been completed by a joint conference committee which has been in session at McAlester, Okla., for several weeks. The scale committee of both organizations formally adopted the working agreement, which will now go before the miners of the state in a referendum election to be held Jan. 10, 1917. Under the contract the 8000 miners affected will receive increases in pay of from 5 to 15 per cent. They will also receive more favorable working conditions.

D. J. Jordan, of Oklahoma City, president, and F. B. Drew, of McAlester, secretary, of the Oklahoma Coal Operators' Association, have tendered their resignations. Their action followed the formal adoption of the new biennial working agreement by the scale committee of the coal operators and the miners of Oklahoma. Vice-President R. T. Price, of Muskogee, will act as president. P. R. Allen was elected secretary of the Coal Operators' Association until that body at the next annual meeting has made provision for the future conduct of its business.

Miners Who Only Work When They Feel Like It

The agreement between the anthracite mine workers' organization and the anthracite operators, which was signed on May 5, 1916, provided for an increase of 7 per cent. in the wages of those employees whose length of working day was not affected by the contract. Those hoisting engineers who were already on an 8-hr. day basis were exempted from this provision and given an increase of 3 per cent., which was the amount of increase also given to the daymen whose

working time was reduced from 9 to 8 hr. It is estimated that these concessions to the mine workers have increased the labor cost of anthracite between 10 and 12 per cent., although it was hoped by the operators that a part of this might be made up by an increased intensity of labor which would result in an increased output per man employed.

Instead of acting as an incentive to greater effort on the part of the mine workers, however, the opposite effect seems to have been produced. Since the agreement was signed, the anthracite region has been the scene of more than the usual number of petty strikes, of which the so-called "button strike" has been a prominent feature, while advantage has been taken of every opportunity to make a holiday and to abstain from work. From statements made to it the Anthracite Bureau of Information at Wilkes-Barre estimates that no less than \$2,000,000 has been sacrificed in wages, and half that many tons of coal have not been mined because of these petty strikes in the four months from May 1 to Aug. 31.

More than \$1,000,000 in wages has been lost in button strikes alone, which, as is well known, are contrary to the award of the Anthracite Coal Strike Commission, which placed itself firmly on record as discountenancing any "discrimination against, or interference with any employee who is not a member of any labor organization by members of such organization."

Petty Strikes for Insufficient Reasons

According to the reports made to the Bureau of Information by companies producing nearly one-half of the total output, 65 different collieries were the scenes of these petty strikes—some of them more than once, and one of them as many as five times. The time lost in each strike has varied from a fraction of a day to six weeks or more, the longest of them usually being to enforce membership in the union. Among some of the other causes have been (1) the dissatisfaction of the miners with the change of starting and quitting time ordered by the companies in compliance with the 8-hr. clause of the agreement; (2) discharge of men for disobedience; (3) sympathy with other strikers; (4) general dissatisfaction with agreement; (5) breaker boys' demand to be paid at noon. One strike alone, caused by dissatisfaction with the agreement, lasted 40 days and resulted in a loss in wages of over \$100,000. The breaker boys threw one colliery idle 2½ days at a loss in wages of \$5,000.

As stated, the production of the region for the four months has been curtailed on account of these interruptions to mining by at least 1,000,000 tons. Idleness because of church days and holidays (not legal holidays) is of even more serious import so far as the public is concerned, for these have been responsible for a loss in possible output since May 1 of nearly, if not quite, 2,000,000 tons. On "Mitchell Day," celebrated on Oct. 30, the entire region was idle. On All Saints' Day (Nov. 1), every colliery in the Wyoming Valley was shut down, as were most of the mines in the other parts of the field. Similar conditions prevailed on Ascension Day, Whit Monday, Corpus Christi Day, St. Peter's and St. Paul's Day, Assumption Day and All Souls' Day. These can be increased by three holy days of the Greek Catholic church, and by six or eight Russian Orthodox church feast days. Had the operators been able to work their mines full time on these days, and had the button and other petty strikes not added to the restriction of output, the present shortages of coal would have been relieved by approximately 3,000,000 tons and the miners' pockets enriched by nearly \$6,000,000.

H. C. Frick Coke Co.'s Wage Scale Since Feb. 10, 1894

Class of Work	Feb. 10, 1894	Apr. 1, 1895	Oct. 1, 1895	Jan. 1, 1896	Apr. 29, 1899	Mar. 1, 1900	Jan. 1, 1903	Dec. 16, 1903	Mar. 1, 1905	Mar. 1, 1907	Jan. 1, 1908	Jan. 16, 1910	Apr. 1, 1912	Feb. 1, 1916	May 8, 1916	Dec. 16, 1916
Mining and loading room and rib coal, 100 bu.	\$0.78	\$0.90	\$0.954	\$1.05	\$1.12½	\$1.25	\$1.35	\$1.10	\$1.20	\$1.35	\$1.20	\$1.35	\$1.44	\$1.58	\$1.66	\$1.82
Mining and loading heading coal, 100 bu.	.88	1.02	1.08	1.20	1.27½	1.40	1.50	1.25	1.37	1.50	1.38	1.50	1.58	1.73	1.85	2.02
Mining and loading wet heading coal, 100 bu.	.95	1.10	1.166	1.25	1.31½	1.45	1.55	1.30	1.45	1.60	1.50	1.62	1.70	1.86	2.00	2.20
Drawing coke, per 100 bu. charged	.43	.50	.53	.60	.64	.72	.77	.63	.70	.77	.70	.78	.82	.90	.95	1.05
Leveling, per oven	.08	.09	.095	.104	.10½	.12	.12½	.10½	.11½11½	.12½	.13½	.14½	.15	.16½
Drivers, rope riders, tracklayers, blasters and timbermen (in shafts and slopes)	1.65	1.84	1.95	2.05	2.12½	2.35	2.50	2.20	2.40	2.55	2.40	2.60	2.85	3.05	3.20	3.50
Drivers, rope riders, tracklayers, blasters and timbermen (in drifts)	1.60	1.75	1.855	1.95	2.02½	2.25	2.40	2.10	2.30	2.45	2.30	2.55	2.80	3.00	3.15	3.45
Cagers, per full run	1.65	1.84	1.95	2.05	2.12½	2.35	2.50	2.20	2.40	2.55	2.40	2.60	2.85	3.05	3.20	3.50
Assistant tracklayers, blasters and timbermen, per day	1.35	1.50	1.59	1.65	1.72½	1.87½	1.97½	1.65	1.75	1.95	1.75	2.00	2.15	2.30	2.40	2.90
Inside laborers, per day	1.35	1.50	1.59	1.65	1.72½	1.87½	1.97½	1.65	1.75	1.95	1.75	2.00	2.15	2.30	2.40	2.75
Dumpers and tippelmen, per full run	1.35	1.50	1.59	1.68	1.75½	1.90½	2.00½	1.68	1.80	1.95	1.80	2.00	2.15	2.30	2.40	2.75
Chargers, per oven	.03	.03½	.037	.04	.04½	.04½	.05	.04	.04½	.04½	.04½	.04½	.04½	.04½	.04½	.04½
Chargers, per day	1.40	1.50	1.59	1.68	1.75½	1.90½	2.00½	1.75	1.85	2.00	1.85	2.00	2.15	2.30	2.40	2.75
Forking cars, capacity 40,000 lb.	.75	1.00	1.06	1.15	1.25	1.50	1.65	1.40	1.50	1.65	1.50	1.65	1.75	1.90	2.00	2.25
Forking cars, capacity 50,000 lb. to 60,000 lb.	.85	1.10	1.16	1.25	1.35	1.60	1.75	1.50	1.60	1.75	1.60	1.75	1.85	2.10	2.10	2.35
Forking cars, capacity over 60,000 lb.	.95	1.25	1.32	1.40	1.50	1.70	1.85	1.60	1.75	1.90	1.75	1.90	2.00	2.15	2.25	2.50

Firebosses were first listed on this scale Feb. 1, 1916, when they received \$3.75 per day; the rate was raised to \$3.90 on May 8 and to \$4.20 on Dec. 16.

Recollections of a Manager

I have never had any great love for the legal profession in general and at times I have gone out of my way to tell some of their number what I thought of their tactics.

Our counsel was forever objecting to the rules and regulations put into effect by our operating officials, but in the end such fears were generally shown to be unfounded and the operating officials were allowed to have their own way. Naturally, since the operating department was so free with its comments about the legal department, the attorneys were anxious to find something to criticize in the operating department.

They had to bide their time for several years, but eventually their patience was rewarded.

We had two serious accidents in quick succession and in both instances the injured parties entered suit against the company. The investigators sent out by our legal department reported that the company was clearly liable in both cases because the men had been allowed to go to work in places known to be dangerous; there was plenty of evidence to show that they had been warned of the danger, but no evidence was forthcoming to show that proper steps had been taken to remedy existing conditions and remove the danger.

This seemed to justify a general investigation of all danger boards inside and out at our mines, and our legal department went at it in earnest.

The results were quite as startling to my department as they were to our attorneys, and the report when completed gave the lawyers the long-looked-for opportunity to show us up; and they went at it with a vengeance.

Over one-half of the danger boards had been used to warn employees to look out for dangers that should have been promptly eliminated. It even looked as if some of the foremen had an idea that their responsibility ended when they saw to it that warnings were placed at all dangerous places. If a car jumped the track and tore off the insulation on a high-tension wire, they put a danger board in front of it; if a gear guard on a power pump came loose and was misplaced, a danger board was found there next day; and so forth and so on.

At the next board meeting one of the lawyers remarked that it would appear as if the easiest way to make our mines safe would be to burn up all the danger boards. If he had stopped there, the operating men would have retired in disgrace; but lawyer-like he had to follow up his advantage. He added that the mention of a danger board in court was generally considered evidence against an employer rather than evidence in his favor, because it proved that the employer was conscious of the danger. I retorted that we had never tried to shift our responsibility in court in spite of the fact that our legal department was not above such tactics.

The results of that investigation were far-reaching. One of our safety inspectors lost his job and several of our mine foremen had to beg like good fellows. Danger boards became veritable curiosities and whenever one was put up it attracted the attention and interest of every passer-by. Instead of boasting about the few accidents that they were having, the foremen began to boast about the absence of danger boards in their mines. The stencil used to paint the boards was misplaced, and it was not missed for nearly a year.

Prisoners of War Investigating Export Business

A curious example of German preparedness has been received by *Coal Age*, in the form of a letter from a German prisoner of war who is obviously laying his plans to engage in the export coal business when peace is concluded. We herewith append the communication in its entirety:

Lofthouse Park, Wakefield,
Yorkshire, Eng.,
27th of Nov., 1916.

Editor of the "Coal Age,"
10th Ave. 36th St.,
New York, U. S. A.

Dear Sir:

As a former subscriber of your periodical, may I ask you the favor of telling me which publication, book, periodical or Government report contains a reliable compilation of monthly prices of American and, if possible, English and German coal and coke, since 1900 up to the outbreak of the war. A spare copy of your periodical, sent under cover bearing your regular business heading would be allowed to pass the Censor and oblige me very much.

Thanking you in anticipation, I beg to remain, dear sir,

Very truly yours,

BERNHARD SCHAFFRAN,

Prisoner of War 1092.

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"It Can't Be Done"

You'll find a coal man here and there
Who acts as if he doesn't care;
Who stands around and hems and haws,
And says, "It can't be done, because"—

Because of this, because of that,
He shirks his share right off the bat.
When asked to help some work begun,
He frowns and says, "It can't be done."

These chaps who say it can't be done
Give me a pain. They spoil our fun,
They hinder work, they hamper play.
They're business spoil-sports night or day.

We're quite aware, both you and I,
That any live, ambitious guy
Who says he *will* and then digs in,
Can put across what he'll begin.

No coal man surely ought to say,
"It can't be done." Don't talk that way.
Instead, say, "Yes, it can be done
By somebody, and I'm the one!"

COMING MEETINGS

Byproduct Coke Producers Association will hold its next meeting Jan. 12-13, 1917, in Milwaukee, Wis. Secretary, W. J. Lavelle, Boston, Mass.

American Society of Civil Engineers will hold its annual meeting Jan. 17 and 18, 1917, at Society House, New York City. Secretary, Charles W. Hunt, New York.

The Rocky Mountain Coal Mining Institute will hold its winter meeting at Denver, Colo., in the Convention Hall of the Albany Hotel, Jan. 22-24, 1917, beginning at 10 a.m. Secretary F. W. Whiteside, Denver, Colo.

Engineers Society of Northeastern Pennsylvania will hold its twentieth annual banquet on Thursday evening, Jan. 18, 1917, at 7 o'clock, at the Hotel Jermyn, Scranton, Penn. The cost per plate is \$3.50. Chairman of the Ticket Committee, A. E. Lister, Engineers' Club, Scranton, Penn.

Editorials

The Energy Stored in Coal

Aside from his own muscular energy and that of various domestic animals—horses, mules, oxen, dogs, goats, elephants, etc.—man uses and has used in the past the energy derived from four principal sources: Burning fuel, falling water, running water, and the wind. While it is quite true that various attempts have been made, and some of them successfully, to utilize the energy of the waves and the tides of the sea and the rays of the sun, these sources of power have as yet never been commercially harnessed, and at the present time offer, possibly, a fertile field for invention.

When energy in large quantities is desired, man at present has two sources that have proved their commercial utility and reliability. These are the energy derived from burning fuel and that from falling water. Thermal energy, say that employed for heating buildings and houses, is usually, but not always, derived from the former source. Electricity, although an almost ideal means of house heating, can seldom compete with coal, gas or oil burned as fuel, except in those rare localities where current may be cheaply generated from falling water.

The heating of even an ordinary dwelling house requires the expenditure of an amount of energy which is almost beyond conception. Let us suppose, for instance, that in the heating of a dwelling house during severe weather, 10 lb. of coal are consumed per hour, or 240 lb. per day. It may further be assumed that this coal contains, say 14,000 B.t.u. per lb. Thus to heat the assumed house for one day would require the expenditure of 3,360,000 B.t.u.

According to one of the fundamental laws of thermodynamics, heat and work are mutually interchangeable. The ratio of this interchange is, however, 1:778; that is, one British thermal unit is equivalent to 778 ft.-lb. of energy, thus the energy generated in heating the house in question would be equal to 2,614,080,000 ft.-lb. Of course no heating system is perfect, and it is probable that not more than about 60 per cent. of the heat generated in the furnace is actually thrown off from the radiators in the rooms heated; that is, utilized in actual house heating. If this assumption is correct, then 1,568,448,000 ft.-lb. of energy are actually necessary to heat the proposed house under the assumed conditions.

A man working to the limit of his endurance in driving such a mechanical device as a pedal or the cranks of a bicycle can exert continuously about $\frac{1}{8}$ hp.; that is, 4,125 ft.-lb. per min., or 247,500 ft.-lb. per hr. To develop by muscular effort the amount of energy necessary to heat the proposed house for one day would require a man working to the limit of his continuous endurance for 6,340 hr. This is equivalent to 634 days of 10 hr. each, or about two years.

At this rate the energy realizable in house heating from one ton of coal would be equivalent to that devel-

oped by a man in working 16 $\frac{2}{3}$ years to the limit of his endurance. Allowing 50 years of active life to the house holder, assuming that he begins work at 20 and continues until 70 years of age, he could in this length of time produce enough foot-pounds of energy, provided that some proper means were available for storing it and returning it to the house-heating system with a perfect efficiency, to heat his house for about 25 days—not quite one month.

From the foregoing it would appear that fuel is indeed nature's storehouse of energy.

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United States Shipping Board

The personnel of the shipping board as nominated by the President on Dec. 22 argues favorably for an intelligent handling of an interesting experiment. The Government has now definitely entered into the business of merchant shipping and in addition has conferred upon five men broad powers of supervision and management.

The board is empowered to organize a \$50,000,000 corporation to build or buy merchant ships. Forty-nine per cent. of the stock will be available for public subscription and such as is not subscribed will be taken by the Government. The ships acquired will be open to lease or charter by private interests but may be operated by the board should private concerns be slow in coming forward. The main intent of the shipping act is to give the United States an adequate merchant marine, to restore American commerce to American bottoms, to supply the deficiency in ships for our export trade, and to remedy sundry other conditions imposed by the European War. In general a determined effort is to be made to open up trade routes which private capital does not yet consider profitable enough to enter. There is further the provision that ships so acquired shall be available as naval auxiliaries in time of war and the stipulation that the shipping board shall have supervisory power over freight rates in American waters.

The plan has been bitterly opposed from its inception, largely because it was considered so great an innovation for the Government to engage in competition with private business on a scale that would tend to stifle individual enterprise, and because it was felt a system of subsidies would be more practical and less wasteful. It has therefore taken the whole power of the Administration in successive sessions of Congress to enact the bill into law, and then only after very important modifications. There is also the feature limiting Government operation of vessels to five years after the war closes, this not being in the original bill. Other amendments have tended to improve the law but the delay has been costly from the standpoint of an early and unqualified success. The Government embarks upon the project when vessels have been bid up to unheard of figures and every shipyard in the country has booked its output for two and three years ahead.

On the other hand the tonnage situation grows more and more serious. Losses are mounting high, and not a day passes without its toll of wrecks, torpedoing and collision with mines. In the months of September, October and November American insurance underwriters sustained losses totaling not less than \$8,000,000. In the case of the shipping legislation, therefore, having in view the use of navy yards for construction of the ships, it may well prove a case of "better late than never."

Herr Ballin, of the Hamburg-American line, was lately quoted as saying that when the merchant fleets of the different nations, including Germany, resume normal activity there will be an excess of tonnage. He apparently feels that ocean trade will suffer from a shortage of goods for export, from high prices of food and raw materials, and from unfavorable rates of exchange. It is quite possible that this will be the situation confronting Germany, especially if the war lasts a year longer, but the current opinion in other countries is favorable to a long-continued boom after the war. With all due allowance for war trade, the increase of a round billion of dollars in exports through the port of New York in 1916 and a gain of 30 per cent. in imports is certainly worth bearing in mind. Statistical authorities have pointed out that "no feature of the relations of countries or sections formerly at war has been more striking than the promptness with which their commercial and business relations were resumed." The nations of Europe will need many imports and at the same time they will make a normal if not an increased amount of manufactured goods.

The outlook for American coal is most encouraging, and on that account alone the activities of the shipping board will be followed with great interest. A large share of the steam tonnage now under construction is intended primarily for freighting coal. Large European markets have overcome their prejudice against the friable and generally higher volatile coal from America; consumers have learned to use it economically, and to adapt their handling apparatus to American-built colliers. This is no inconsiderable gain from the standpoint of export trade, and it is in the export trade that there is the urgent pressing need for American shipping.

There is also the great market in South America, west coast as well as east, both more accessible to American coal than to any other country provided we have the ships and our coal factors will take the trouble to prepare and screen their output in the way desired by South American consumers, and if they will be careful to build up confidence in their quotations, discriminating fairly between grades, and making suitable arrangements for the longer credits to which trade in these countries is accustomed. The prime requisite, however, is American ships that can compete with those of other nations, ships that can be relied upon for a definite volume of coal moving regularly. Our unexcelled loading facilities will then help show South American merchants that American coal factors are in earnest about trade prospects of a permanent nature in the future.

The success that has attended the regular dispatch of two American colliers to Alexandria, Egypt, for more than a year will indicate to the new shipping board the possibilities for American coal abroad, if only suitable freighting arrangements can be put into operation. Of course there are problems under the navigation laws to be worked out and relative costs to be inquired into and

to be made the basis of new legislation that alone may justify the board's existence. There is also the important matter of standardizing the construction of freight ships. Certainly, all told, there is a most promising field, and we hope the opportunity will be improved. The first official action of the board is awaited with no little concern.

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Yet a Further Note on Pyrite

The reader will note elsewhere in this issue an interesting article by C. M. Young on "The Iron Pyrite Found in Coal," a subject to which the author of that article has given no little attention hitherto, he, on behalf of the United States Government, having investigated the pollution of water by coal mines.

Mr. Young's remarks on the difficulties met with in the merchandising of pyrite from coal and the possibilities of that business will be read with interest. He is not oversanguine, but he believes that a campaign of education among the users of pyrite might establish a sizable market into which at least pyrite that is easily cleaned and not too remotely located might profitably enter.

A prudent man, he is not dogmatic about the origin of the pyrite in coal. As it is an academic question, we shall probably be a long time passing positively beyond his dictum: "Presumably it is not one of the original constituents of the coal, but is an added impurity."

In this connection it may further be said that there is another source of pyrite in coal besides that mentioned editorially in *Coal Age* of Dec. 16 under the caption "Is the Sulphur Found in Coal Innate or Extraneous?" It is a source not noted in "Dry Preparation of Bituminous Coal in Illinois," by E. A. Holbrook, yet conceivably it may be important.

The peat bogs from which coal is derived grew by slow increment. While they were forming, over them flowed and rested waters containing more or less of dissolved sulphates. These sulphates would be deposited on the peat surface. The methane would sooner or later convert these sulphates into sulphides, and might even so convert them before deposition. Thus may have been largely formed those myriads of interbedded pyrite flakes that are the despair of those who try to clean coal—flakes that often bleach out and leave the fuel looking as if it had been in a snowstorm.

It may be that this source of sulphur accounts for the large amount recorded by Dachnowski as being found in some abnormal peat bogs, such as those at Garden Isle, Medina County, and Amanda Township, Fairfield County, Ohio. Interbedded pyrite, when not an outcome of original sulphur, was probably formed during the accretion of the bed and not, as some have thought, after the bed was completely laid down. Pyrite has probably three origins—vegetation, peat-bog waters, and the crevice water of the hardened coal.

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The House Post Office Committee has reported favorably the Appropriation Bill with the Randall rider which provides for an increase in postage on second-class matter. If passed this bill will kill hundreds of national magazines and trade journals. Write your congressman opposing the bill today.

Department of Human Interest

Colorado Fuel and Iron Co.'s Schools

The East might well go to school in the West. Those Easterners who have quite generally concluded that the West is not so far advanced as the East in education, and they are many, would be surprised to see what magnificent graded schools with domestic and mechanical training departments there are in Arizona. The towns may have sprung up in a day, but the schools are not forgotten. The scholars trained in these new metal-mining towns would find themselves with every advantage over their Eastern cousins should they come back to the towns of Pennsylvania, and they might be quite contemptuous at the relative crudity of the schools at the county seats and towns of equal importance in the so-called Keystone State.

Education is given its proper place throughout the West. There is, of course, nowhere in the Colorado Fuel and Iron Co.'s plants anything like the substantial institutions at Globe or Bisbee, Ariz., but in proportion to the size of the population some of the buildings that have been illustrated in *Coal Age* are at least equally fine and the training supplied is in no way inferior.

During the school year 1915-16 there were nearly 3500 pupils enrolled in the 20 coal-mining, iron-mining and quarry camps of Colorado, Wyoming and New Mexico. To train these scholars there were nearly 100 teachers all of whom were carefully selected by the school boards so as to secure teachers of ability and experience.

The schools at these villages are part of the regular school systems of the states in which they are situated and are subject to all state and local laws. They are not the Fuel and Iron Co.'s schools in the sense that they are under the company's direction, though in many cases the company as the holder of the taxable property of the district bears virtually the entire expense of maintenance.

In some places where funds were not immediately available the coal company erected buildings and leased them temporarily to the districts. But in nearly all the villages the title to the school property is vested in the district and not in the company.

SCHOOLS GOVERNED BY ELECTED REPRESENTATIVES

The statutes of Colorado require that public schools in rural districts shall be administered by a board of three men who must be residents of the district. Where all the persons in any village are employees of the Colorado Fuel and Iron Co., these three must inevitably be drawn from among those employees. Not infrequently miners are named as members of the boards, and even when they are not so elected it is from their own choice, as the miners outnumber the company officials and so control the elections.

In many of the camps instruction is given in manual work, and the girls are taught sewing, sanitation and other home economics. First aid is often taught the children before they are able to read. The boys are



Courtesy of "C. F. and I. Co. Bulletin"

AUDUBON SOCIETY OF CAMERON SCHOOL, SHOWING THE BIRD HOUSES MADE BY THE PUPILS IN THE MANUAL TRAINING DEPARTMENT



Courtesy of "C. F. and I. Co. Bulletin"

SCHOOL PICNIC AT TERCIO, MAY 16, 1916, ATTENDED BY OVER 1000 CHILDREN AND ADULTS FROM LAS ANIMAS COUNTY VILLAGES

The Tercio School is in center rear ground of the picture

organized in Boy Scout battalions, but, perhaps unfortunately, no military training is given.

At many of the villages there are Camp Fire girls. Mention of the circulating libraries has been made in an earlier account and something has been said of the basket weaving. Picnics are provided for the school children. An important affair of this kind was held at Tercio in May, 1916. Scholars from various parts of Las Animas County gathered on that occasion, no less than 1000 children and adults being present.

High school instruction was for a while provided by sending advanced pupils to larger towns. The plan was not successful. So in the school year just past a high school was started at Rouse, in Huerfano County. The experiment proved a success and as a result the Las Animas County Joint Committee on Recreation and Education called a conference in Trinidad and urged on that conference that it vote a recommendation to all the school boards in the Colorado Fuel and Iron Co. villages in Las Animas County, to the effect that the first two years of high-school instruction be provided as part of the regular public-school system. They were Fuel company employees and officials in that committee and their action resulted in a heavy burden being put on the company, for it will have to pay for the buildings and the hire of teachers. However, it is quite willing to do this.

MORAND'S PLAN FOR CULTURAL DEVELOPMENT

At the Sopris village a plan has been adopted which has been named after Sopris. It should rather have been named after its ingenious originator, E. G. Morand, the principal of the school. Mrs. Mary P. Bradford, "Colorado State Superintendent of Public Instruction," says of it:

For some time Mr. Morand has been giving credits to the children for home work as is done in many places in Colorado and in other states as well, but now, because of the large foreign population, he has planned a course of instruction to be given by his pupils to their mothers and fathers at home, which will include, not only the domestic science to which the children's work has been hitherto

confined, but instruction in reading and writing in English and a rudimentary course in history, civics and citizenship.

Here is a turning of the tables with a vengeance! Education is extended from the school to the home. Not only this, but the home environment having first been transformed by the domestic-science instruction, the heads of the family are next taught by their own children the meaning of the mighty nation in whose civic life they wish to share. Obviously, the effect is not confined to the taught, but the little teachers themselves become possessed with a magnificent realization that they belong body and soul to a country whose welfare depends upon the way they themselves think, speak and act.

At stated intervals during the year the principal visits these homes, inspects the family arrangements, and tests the knowledge of the parents, and if the home environment is based upon sanitary principles, adjusted pleasurably and comfortably, and the parents give satisfactory evidence of advance in their studies, the principal credits the children with the number of points thus earned.

There are two strong motives that tend to make this plan eminently workable. First, the parents are induced to study by the desire to win these credits for their children, thus gaining a higher rank in their school work, and, second, to take the school to the student rather than to bring the student to the school is a remarkably sane and practical thing to do. The tired workman, the exhausted housewife, do not feel like going out to grapple with subjects that, to them, seem to be appallingly difficult. Yet, these same people, after a little rest at home, may be quite ready to join in the delightful playwork that brings honor to their children and increased respect for themselves.

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Methodical First-Aid Plans Laid in State of Indiana

Dr. August F. Knoefel, who has charge of the first-aid department of the Indiana Bituminous Coal Operators' Association, has organized the miners' first-aid teams of Sullivan County in the State of Indiana. A committee consisting of George Wilson and James McNair, of Sullivan, and Albert Mullikin, of Paxton, has been selected to arrange a preliminary meeting to be held for organization purposes. Representatives will attend from every mine in Sullivan County, and when the county organization is perfected, meetings will be held at Carlisle, Shelburn and Sullivan. There will be a meeting each week at one of the three points mentioned. Doctor Knoefel will have charge of the county meetings, instructing the teams in the work and giving them problems in first aid. By means of a first-aid demonstration at the annual meeting of the Sullivan County Medical Association Doctor Knoefel aroused the interest of the doctors and was assured that he would have plenty of judges when he needed them.

Discussion by Readers

Training for Mine-Rescue Work

Letter No. 1—In connection with the several letters that have been written relating to mine-rescue work, allow me to suggest that there is no phase of the work of greater importance than the training of all mine workers for such duties.

The idea prevails among a considerable number of men that the training for this work should be carried to the point of exhaustion. Many believe that a man in training should perform an amount of work that will tax him to the utmost to accomplish it in a given time. We never see an athlete trained to the point of exhaustion and, in my opinion, such a policy is wrong in reference to mine-rescue work.

When a rescue team is trained at a regular and steady gait, better results will always be obtained, as no time will be lost by the men sitting down until their breathing again becomes normal, which they must do when they work too rapidly. But, when a task is performed more deliberately the worker is not exhausted and holds out longer. In the end he will accomplish just as much work in the same time as when he is urged to hurry in his performance.

It must be remembered that a breathing apparatus will only supply a certain amount of oxygen per minute, and men should be trained to work so that they will not consume the oxygen at a more rapid rate. The wearer of an apparatus must learn to adapt his work or exertions so that he will not exceed the limitations of the apparatus on which his life depends.

Another point that is of the greatest importance is to impress on all members of a rescue corps the absolute necessity of obeying strictly and promptly the orders of the one chosen to be their leader.

Confidence in one's own ability as well as in the apparatus worn, thorough reliance on the capabilities of the other members of the squad, the exercise of self-control and the elimination of any attempt to excel or outdo another are important features of rescue work. No one should be allowed to wear an apparatus after a fit of illness until he has undergone a sufficient test in the training gallery, where he could be rescued if overcome.

—, Ill.

"SAFETY ALWAYS."

Testing Mine-Rescue Apparatus

Letter No. 2—I was glad to read the letter by "Safety First," *Coal Age*, Dec. 16, p. 1017, as I believe he has touched on an important matter. In my opinion, all breathing bags should be inspected thoroughly and regularly and, on no account, should any apparatus be put on and the wearer enter a poisonous atmosphere, unless he is certain that everything is in first-class condition.

In speaking of the Fleuss apparatus, this correspondent says, "The breathing bag should be examined on both the inner and outer compartments," to make sure there are no leaks in the bag. He states, "When the wearer

is surrounded by a poisonous atmosphere, containing carbon monoxide, a very small leak in the apparatus will quickly prove fatal." In my opinion, with a slight leak in the bag caused by a pin-prick so small that it cannot be detected except by a careful test, there will be small chance of any carbon monoxide penetrating into the bag, since the pressure within is always greater than the external or atmospheric pressure. As stated, the reducing valve should be tested often. I would say every week or every two weeks at the most, by the meter supplied for testing the Fleuss apparatus.

PRECAUTION.

Herrin, Ill.

Explosive Combustion of Dust

Letter No. 2—Referring to the explosibility of coal dust discussed by John Verner, in *Letter No. 1, Coal Age*, Dec. 23, p. 1057, this is indeed a timely subject. The winter months are conducive to the production of an appalling list of mine explosions.

Instead of coal operators of the Clearfield or any other region contending that inasmuch as there has never been a coal-dust explosion in their mines, dust does not form a dangerous factor in the operation of those mines, they should realize that, for this reason alone, it is important to be especially vigilant. Explosions are constantly occurring in mines in which there never had been previous explosion. Many of these mines were boasted "model mines," and pronounced relatively safe.

It should here be further emphasized that coal of any marketable value whatever will certainly generate dust that is highly explosive under certain conditions. These conditions should ever prompt us to be on our guard.

WHAT THE BRUCETON TEST DEMONSTRATED

Regarding the Bruceton test, by which it was demonstrated that the Clearfield dust will explode under certain conditions, allow me to say that if the engineers of the Bureau of Mines or anybody else can explain why there never was an explosion in the Clearfield region, the information will doubtless be highly appreciated. Still, that knowledge is not so vitally necessary that the operators can afford to be remiss in the precautions they should take to prevent an explosion occurring.

Mr. Verner claims, however, that "the Bruceton test can have no practical value until it is shown why, if the dust is explosive, there has never been an explosion in the Clearfield mines." I believe that, on the contrary, the value of this test is most significant. There may be any number of reasons why there never has been an explosion in the Clearfield mines, and the same may be said of other regions, but that after all does not prove there never will be one.

The Clearfield management may have been interested in minimizing the possibilities of disaster during this extended period. Efficient management is everywhere awakening to the peril that lurks in the dangerous accumulation of coal dust in mines; and, as a result,

there are many mines that never had a coal-dust explosion, and probably never will.

The Bureau has proved conclusively by the Bruceton and other tests that coal dust will explode. It is rather unreasonable, at this time, in view of the progressive character of its work, to insist upon the Bureau's explaining the difference between the results of the Bruceton test and the practical operation of the Clearfield mines during an extended period. It is naturally assumed that the mine managements in that region have, as far as practicable, prevented the conditions that obtained at the Bruceton test.

The real lesson to be drawn from these tests is that any coal dust will explode under certain conditions, and that we should use every effort within our power to prevent the dangerous accumulation of coal dust in mines, whether such mines are gaseous or not.

Thomas, W. Va.

W. H. NOONE.

Coal-Mining Examinations

Letter No. 11—As a member of an examining board, I have been greatly interested in the series of letters discussing the style of questions that should be asked and referring, incidentally, to conditions that exist in different examining boards. I thoroughly believe that, by this means, such changes can be accomplished in the matter of conducting examinations as to adapt them to the needs of modern mining and develop in candidates greater efficiency in the several positions they are anxious to fill.

The first two letters on this subject, published in *Coal Age*—that of William Crooks, Sept. 23, p. 513, and that of Edwin Husband, Oct. 21, p. 685—severely criticized the work of some examining boards; but, I am glad to say, these criticisms do not apply largely to the bituminous boards of Pennsylvania, which the law of 1911 and the attitude of mine inspectors regulate and control in a way that effectively guards against the introduction of impractical questions in examinations.

REQUIREMENTS OF THE BITUMINOUS (PENN.) LAW

The bituminous mining law (1911, art. 24, sec. 2) provides for an annual meeting to be held at Pittsburgh, two weeks before the date set for the examinations to take place. The law states that the purpose of this meeting is to discuss the general scope of the theoretical and practical questions to be given in the examination, to adopt rules and select a committee of six of their number, comprising two inspectors, two miners and two operators, managers or superintendents to draft the questions that will be asked in the coming examinations held by the several boards throughout the bituminous region. The committee thus appointed for the work is governed by three considerations: (1) The list of subjects discussed and adopted, (2) the practical nature of the questions suggested and (3) the average ability of the candidates.

Referring again to the letter of Mr. Crooks, allow me to disagree with him in regard to the revolutionizing of mining methods calling for such a change in the style of the questions asked as he suggests, if he means that theoretical questions relating to the principles of mining should give way wholly to questions relating to the everyday difficulties encountered in mines. On the contrary, I believe that modern methods in mining have accentuated

the need of these same theoretical questions and the necessity for increased technical training on the part of all candidates for mining positions.

One cannot deny that the work of the Federal Bureau of Mines, since 1908, has demonstrated the growing need of practical knowledge on the part of mine officials who must contend daily with problems that arise in modern mining practice. It is not, therefore, my desire to undervalue the questions suggested by Mr. Crooks. A careful reading of the letters thus far submitted show that the conditions, methods and practices in use in different states require somewhat different treatment in the examination of candidates for service in those mines.

For example, in Pennsylvania, the law provides that a competent mine electrician shall be employed in all electrically equipped mines. There is, consequently, no need for the mine foreman to look after such equipment. Similar instances show that the style of questions, in this respect, must be left to the judgment of individual boards, who are or should be best acquainted with their own conditions.

SUGGESTS OUTLINING THE EXAMINATION

One of the greatest stumbling blocks in the way of candidates preparing for examination is the lack of definite information regarding the subjects usually included in mining examinations and which they ought to study. Also, they should understand the nature of the practical experience required of candidates before they can be granted certificates of competency. Notwithstanding this fact, few efforts are made to guide mining students in the study of those subjects that are essential.

In my opinion, every state mining department should prepare an outline of mining studies embracing those subjects that form the basis of examination questions for mine foremen, assistant foremen and firebosses. This outline of the requirements in examination should be sent to all candidates on request. By this means, effective aid would be extended to candidates and a great impetus given to the study of mining.

Permit me to say, in closing, that the experience of mine foremen today is that, had they known years ago what they have since found to be of the most value to them in the performance of their duties in the mine, they would have devoted their spare time largely to the study of technical mining and fitted themselves better for the responsibilities of their position.

Hackett, Penn.

ALEXANDER WAUGH.

Letter No. 12—I was interested in the letter written by John MacNicol, *Coal Age*, Dec. 2, p. 939, regarding the qualifications of applicants for mine foremen's certificates, in the State of Pennsylvania. Mr. MacNicol says, "It has always puzzled me to know how Pennsylvania legislators were justified in the enactment of such a law."

Let me add, it has been more than a puzzle to me. In my opinion this law was enacted for the purpose of keeping competent mining men hailing from other states from securing positions as mine foreman or assistant foreman in Pennsylvania. If this is not so, I would ask, Why compel a competent person from another state to serve a period of five years in the mines of Pennsylvania, before he can secure a mine-foreman's or assistant-foreman's certificate in that state?

Can any sensible person believe that because a man has not worked in the coal mines of Pennsylvania he is unfitted to sit at an examination held for the purpose of ascertaining the competency of men to fill an official position in the mines of that state? I have worked with some of the best men—men that were brought up in the mines of Pennsylvania and who held first-class certificates for that state—but none of them was any better than the certificated men brought up in the mines of the State of West Virginia.

I don't wish to be understood as knocking the mining men of Pennsylvania. I simply mean that a person educated to any trade, in any state, is no better than a person educated to the same trade in another state. I believe, however, that our West Virginia mining law is not as unfair as that of Pennsylvania, inasmuch as it does not require any certain length of service in the coal mines of the state.

The necessary qualifications of applicants for these certificates, in West Virginia, is five years' service in coal mines, but the five years can have been worked in any coal mine, in any state. The applicant has to be a citizen of the State of West Virginia, but he may be no more than a boarder. I believe that a person should be required to be citizen of a state for a period of one year, before he is allowed to sit at an examination for the purpose of securing a certificate to act as mine foreman or fireboss in that state.

FIREBOSS.

Farmington, W. Va.

Bonus System in Mining

Letter No. 9—I have just returned from a visit to a mine where a bonus system is in operation and evidently proving a great success. It seems to be a fair method to all concerned. It has very materially increased the output of the mine and, it can be truthfully said, has served as a substitute for an increase in wages.

Not the least among the advantages of the scheme is the fact that it makes Saturday the best day in the week by producing the largest tonnage of any of the other five days. The plan adopted gives to every employee an extra pay for that day, which goes to replenish the family supplies at the end of each week and helps to tide over the interval between two regular pays.

The method is simple, which I will describe briefly, as follows: The mine in question pays the miners each alternate Saturday, for the work of the two preceding weeks. In addition to this, however, every Saturday night each employee is paid an extra amount, or bonus, equal to his earnings for that one day.

It is clear that this plan adds exactly one-sixth to the earnings of every shifthand and mine official and, practically, increases the miner's earnings in about the same proportion. While that means an increase of about 15 per cent. in the pay roll, it has amounted to very little more than the increase in wages paid by other operators in the district and has succeeded in producing at this mine a satisfied lot of men and an increased output with always a good tonnage on Saturday.

The same satisfaction cannot be said to exist at the other mines operating in that district. When practically all of those mines have been idle at times, this one mine has maintained an output of 300 tons a day, which is increasing rapidly. It is a fact that the mine

has practically doubled its output since this plant was inaugurated some three months ago.

It will be freely acknowledged that the same method would doubtless prove impracticable for adoption at some of the larger operations, but it has certainly proved its merits in this case.

G. E. ALLOWAY.

Ironton, Ohio.

Mine-Accident Record

Letter No. 2—An accident occurred Dec. 9, 1916, at No. 3 Crown Hill mine, by which two shotfirers lost their lives. In the later examination of the place by the mine inspector, mineboss and fireboss, it was found that the entryman had overcharged his hole with powder, besides using a short length of fuse. He had been warned several times against both of these practices.

It was the custom for the shotfirers, at this mine, to go below about 3 o'clock in the afternoon and start their work, which required less than two hours to complete. The hoisting engineer on the surface understood that if they did not come out of the mine by 5:30 something was wrong.

It would seem that the blame for this accident did not altogether rest on the entryman, since the shotlighters were proceeding, contrary to the usual custom, with the air instead of advancing against the current. The usual practice is to start the firing of shots on what the miners call the "end of the air."

In the same mine it was found, the following day, that the entryman in the next heading to the one where the accident occurred, had a hole drilled 4 ft. 6 in. on the solid and charged with about six quarts of powder. Since the blasting powder used will run practically 30 cu.in. to the pound, the weight of powder in this charge was very close to 12 lb. It was found that the man had used 12 kegs of powder, or 180 lb., in 15 days, which is an average of 12 lb. each day.

The mining law of Indiana limits the weight of powder that may be placed in a hole when blasting coal or other material in the mine to 8 lb. for each hole, and specifies that the hole must not be drilled more than 1 ft. on the solid. Also, the distance from the hole to the loose end, measured at right angles to the direction of the hole, shall not exceed 5 ft. It would seem that in both of these instances the men violated the mining law of the state, but no prosecution followed in either case.

Clinton, Ind.

T. GOLDON.

Timbering after Machines

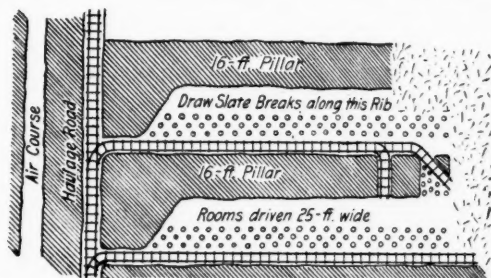
Letter No. 3—Reading the letter of John H. Wiley, *Coal Age*, Dec. 2, p. 941, brings to mind my experience some time since in mining a coal under a bad drawslate.

When taking the position as assistant foreman in a certain mine, I found, on examination, that a considerable extent of old workings had been abandoned, owing to heavy falls of roof while the places were advancing. I estimated that about two-thirds of the coal had been left behind and lost, but, later, found that the mine map showed practically 75 per cent. of the coal as unmined.

Studying over the matter and observing closely the conditions existing in the live workings, I found that the same results were still obtained and much coal was being lost that could never be recovered. In consultation with

the mine foreman, one day, I suggested that a different method of working might produce a greater extraction of the coal. The result was that I was allowed to put in execution a plan that appealed to me as being capable of producing better results.

The proposed plan of working is shown in the accompanying figure. It consisted in driving the rooms 25 ft.



PROPOSED METHOD OF WORKING UNDER DRAWSLATE

wide on 41-ft. centers, instead of 50-ft. as before. This reduced the width of pillar to 16 ft. The track was laid in the center of a 7-ft. roadway along the straight rib. Three rows of posts were carried on the other side of the track, the posts being set 4 ft. apart each way and staggered, as shown in the figure. This left an open space about 10 ft. wide between the back row of posts and the rib.

The result of this plan was that the drawslate would break along the far rib in each room and fall, which at once relieved the pressure over the roadway where the drawslate was supported by the posts and the straight rib. This plan allowed the rooms to be driven up to the limit without causing any heavy falls of roof.

When drawing back the pillars, the work was started by driving into and through the pillar, so as to divide it into equal sections, and working out each section separately. As the work proceeded, posts were set to hold up the drawslate until all the coal in the section was taken out, except a small stump, as indicated in the figure. This stump was finally shot out and most of the coal loaded into the cars.

Allow me to suggest that a drawslate always has a tendency to work and will break sooner or later at some point. The panel system adopted by Mr. Wiley and shown on page 941 would, in my opinion, prove to be expensive and require much timber. The driving of a narrow place under a drawslate, I have always found, requires much timbering, and the roads must be cleaned up regularly from falls of rock. It does not seem to me possible to use a chain machine in the method he suggests. In the plan I have just described, we are using chain machines for drawing back the pillars and have gotten good results. The plan is working fine, and practically all the coal is being taken out.

The method of crossbar timbering suggested by Mr. Wiley is quite different from that we have employed, which is to follow the machine closely with posts set sufficiently near together to prevent the drawslate from falling. I hope I have made my meaning clear.

McIntyre, Penn.

ASSISTANT FOREMAN.

Letter No. 4—In reply to Mr. Wiley's inquiry, *Coal Age*, Dec. 2, p. 941, allow me to say that where crossbar timbering is required to protect the machinemen while cutting the coal and it is not practicable to set two

posts, the time and money spent in cutting the hitches in the coal to support one end of the bar will be well spent. I would not depend on wedging the bar over a single post as he mentions. The second post should be set under that end of the bar supported by the hitch cut in the coal, as soon as possible after the machine has passed from beneath.

Let me say here, however, that, in my opinion, any machineman would be warranted in protesting against cutting coal under such conditions. In machine work, good, sound, substantial timbering should be the rule, since the machine runner can hear nothing but the noise of the machine when it is in operation.

I note that Mr. Wiley claims they "have never had an accident" in the use of his method, which he regards as "satisfactory and entirely safe." That no accident has yet occurred may be true; but let me ask, What will be the result eventually? I have known cases where bad judgment has dictated methods that were evidently unsafe and, for years, no accident took place; but the long expected and delayed result did come sure enough in the end.

A general study of the laws of timbering and a simple calculation of what weight such a cantilever will support will, I believe, convince Mr. Wiley that such methods are what I heard an old deputy (fireboss) call a post set in the middle of a bar 6 ft. long. He called it a "mantrap" and although that was 22 years ago, it made an impression on me that I have always remembered. I would style all such methods of timbering as those to which I have just referred "mantraps," for such to my mind they are.

W. H. LUXTON.

Linton, Ind.

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Textbooks in Examinations

Letter No. 6—The question of allowing candidates the use of certain textbooks in state mining examinations is evidently one of great interest, judging from the discussion now running in *Coal Age*. It appears that those who have expressed opinions on the matter so far are not wholly of the same mind.

I was particularly interested, however, in the opinion expressed by Mine Inspector F. W. Cunningham, *Coal Age*, Dec. 23, p. 1058. No one should be better able to give an unbiased and practical opinion, on the use of textbooks by candidates in examination, than one who has been a member of a board of examiners for an extended period of years. Inspector Cunningham can no doubt recall many instances that have come under his own personal observation of good practical mining men, struggling in mental agony for hours in an endeavor to recall formulas or constants required for the working out of some problem in pumping, or ventilation.

After going through the mill on four different occasions, in different states, I believe that the successful candidate never attempts to remember these formulas and constants after he leaves the examining room. If the experience of others who have gone through examination is in any way similar to mine, it can be truthfully said that the actual necessity of memorizing such data is certainly not worth the time consumed in trying to drill the formulas into one's brain.

In actual practice, the hard-fisted, practical mine foreman no more attempts to retain the formulas necessary

for working certain problems propounded at the examinations, than the school boy tries to remember his Latin after leaving school. Personally, I know about as much along this line now, although I had to cudgel my brain to pass the examination, as I do about astronomy, and I venture to say that nine out of ten mine foremen will admit the same after a couple of years in actual mine management.

To allow the applicant for a certificate of competency to refer to a certain textbook to obtain the necessary formula, during his examination, cannot so far as I can see do any harm to anyone. On the contrary, it might render it possible for many a deserving applicant to pass the examination who would otherwise fail, simply because he cannot recall the formula.

THE "BOGEY" IN EXAMINATION

The "bogey" in the way of many a mining man who has at some time or other aspired to obtain a certificate of qualification has been the necessity of memorizing the necessary formulas, and I cannot understand how allowing the student to use in his examination a textbook containing these formulas and constants could work any harm or lower the standard of efficiency in any way.

I never could figure out, in my own mind, what benefit can accrue by compelling hard-headed practical mining men, such as the aspirants for certificates usually are, to memorize formulas. I do know, however, of men who I have every reason to believe would have made excellent mine foremen, from a practical standpoint, but were deterred from standing the test through the fear of their inability to memorize a list of formulas necessary in the test.

SIM. C. REYNOLDS.

Houston, Penn.

Letter No. 7—The question of the use or exclusion of textbooks in examination is a matter that seriously affects every candidate who is striving for a certificate of competency. Much has been said in favor of allowing such a use of textbooks by candidates.

It was with deep interest that I read the letter of Thomas Hogarth, *Coal Age*, Nov. 25, p. 896, in which he ably presents the case in favor of the use of textbooks in examination. I desire, here, to point out both the advantages and disadvantages involved in this suggestion and to show, if I can, that the exclusion of textbooks from an examination is productive of better results than would come from their use by candidates.

ADVANTAGES OF THE PROPOSED USE OF TEXTBOOKS

Chief among the advantages to be derived by the use of textbooks in examination is the fact that such a practice would make the solution of technical problems much easier for those who have familiarized themselves with the book. Moreover, it would give a candidate more confidence to know that the formula he is using is correct, as taken from the book.

Much time will be saved and confusion avoided when a candidate can refer to a textbook instead of depending on his memory to apply the proper formula or constant required in the solution of a problem. In fact, the candidate is entirely relieved of the labor of memorizing such formulas and constants for use in examination.

Finally, it cannot be denied, as it is undoubtedly true, that the knowledge that a textbook will be allowed in examination would prove a great incentive to mining

men to study and prepare themselves to take the test and secure a certificate of competency from the board. At present, many practical men are not encouraged to study, feeling that it would be a waste of time, since they know that they will not be allowed to use the same textbook in the examination.

ARGUMENTS AGAINST USE OF TEXTBOOKS BY CANDIDATES

Having mentioned some of the more important advantages arising from the use of textbooks by candidates in examination, it will be interesting to consider a few of the arguments against this proposed change. Let me say, first, that I believe a certain amount of memorizing is good for any man. If that is true, the use of textbooks would mean a loss to mining students preparing for examination, as it would not then be necessary for them to tax their memories to the extent of being able to recall, when needed, a few simple formulas.

Again, I question whether a man should be taught to run to his textbook for aid when solving every problem that presents itself in daily practice. Let me ask, Is it not better for a man to cultivate his memory and use his own reasoning power in the simpler matters that come to his attention? I believe that his ability to reason correctly is greatly strengthened in the effort to memorize and rightly apply the fundamental mining formulas.

Mr. Hogarth advances the argument that the use of a textbook in examination would place the practical man, experienced in the mining of coal but having little schooling, on an equal footing with the younger man who has little or no experience in mining but more education and technical training. I want to ask, Would the textbook be likely to help a practical man who has had so little schooling? Also, is there not danger that the free use of a textbook would have a tendency to make the examination more theoretical than at present and, consequently, more difficult for the practical man?

To make my meaning clear, let me suggest that examining boards are quite well aware that they cannot go very deeply into theory and still keep the examination within the bounds of reason for practical men. Now, if candidates were to be allowed the use of their textbooks, it appears to me that there would be a tendency on the part of examining boards to include still more technical questions involving complex formulas. Should this be the case, the practical man would be worse off than before, notwithstanding he was allowed the use of all the textbooks he could bring to the examination.

For the reasons I have given, it does not appear to me to be either wise or just to allow the use of textbooks by candidates in examination. While I believe that everything reasonable should be done to encourage mining men to study standard books on mining, it seems to me that this should be done before going to the examination.

In closing, permit me to suggest, as an alternative, that examining boards in the different coal-mining states issue, from time to time, a guide for prospective candidates, stating clearly the essential formulas that should be learned and outlining in a general way the range of questions that would be asked in the coming examination. This would give the men intending to take the examination an opportunity to secure the necessary textbooks and study those subjects that are most important.

Curtisville, Penn.

M. D. COOPER.

Inquiries of General Interest

Mine Roof That Slacks

I want to ask the readers of *Coal Age* who have had experience in the working of a seam of coal overlaid with a roof that slacks readily under the action of the air current, if they will favor me with their advice and suggestions. In the mine I am working, there is the same trouble in the rooms as in the entries, although a comparatively small quantity of air is passing.

The roof slate or shale in this mine has a tendency to flake off and fall. In contact with the air the material forming the roof seems to disintegrate rapidly. The seam of coal lies practically level and varies from 4 to 5 ft. in thickness. The coal partakes largely of the nature of the roof, in respect to its hardness; in other words, it is tender and friable.

I shall greatly appreciate any suggestions from those who have had experience in working coal under similar conditions, and to learn from them the best method to employ in order to secure the largest extraction.

Morgan, Penn.

RUDOLPH VALDUGA.

[We are sure that some of our practical mining men can give this correspondent just the information he needs, and we await their suggestions. A rough sketch or drawing will greatly assist in making clear any plan suggested, and we hope that replies to this inquiry will be illustrated.—Editor.]

Yield on Coal Investments

I am interested in a coal proposition regarding which I am looking for technical information. It is unnecessary to say that I am a layman, having no practical knowledge of the coal business, in respect to either its requirements or its possibilities. I have been referred to *Coal Age* and take the liberty of asking the following questions:

1. What is the rule or formula by which one can estimate the probable output of coal or the available tonnage per acre in a given tract?

2. Knowing the tonnage per acre underlying a piece of land, what is a safe estimate of the returns that may be expected on such an investment?

INQUIRER.

Melvin, Ky.

1. Any estimate of the amount of coal underlying a given tract to be of value must be based on the results of reliable prospect records taken at different points and showing the thickness and quality of the coal seam underlying the land. The tonnage per acre is then calculated for the average thickness of the seam for each section of the land, allowing 43,560 sq.ft. per acre, and estimating the unit weight of the coal from its known specific gravity, determined by samples of the coal taken from the drillholes.

The possible output available in a given tract can only be estimated with any accuracy by having a prac-

tical mining knowledge of the conditions relating to the method of mining to be employed and assuming a certain percentage of extraction, which will vary greatly in different localities and when mining under different conditions. Without this practical knowledge of the mining of coal, no estimate of any value can be made.

The methods of mining coal, in respect to its complete extraction, have been greatly improved within recent years. Formerly, when less attention was given to the exhaustion of the coal fields than at present, complete extraction was not regarded as important. In many localities, the extraction of coal from a seam did not exceed two-thirds of the amount underlying the land. There was a large loss of coal arising from improper methods of working the seam. These methods permitted heavy roof falls to cut off much of the coal, which was irretrievably lost.

Today, owing to the growing scarcity of coal and the increasing demands in the market, a more complete extraction is imperative, and it is not uncommon to learn of mines that are taking out 90 and 95 per cent. of the coal. On the other hand, there are conditions that exist in some localities that make it impossible to even approach this percentage of extraction.

Again, the labor question has a very important bearing on the percentage of extraction. In general, a much larger allowance must be made for loss of coal in union mines, owing to the refusal of union miners to drive the narrow work required for economical extraction in many districts. All these circumstances must be carefully considered by a practical mining man who knows the conditions and understands the requirements of the district in question.

2. In answer to the second question, it may be stated that the returns which may be expected on the investment can only be estimated from a careful review of the situation. This will include the consideration of the value of the lands purchased and many conditions relating to the shipping and transportation of the coal and market requirements, together with the relative supply and demand and competition with other coal, which will greatly modify the selling price in the market, to which the operator must always look for his income.

There is a great variation of these conditions, not only in different mining districts but, from time to time, in the same district. These variations in value and requirements cannot be forecast, but must be provided for suitably by the maintenance of a sinking fund of sufficient size to safeguard the operations and insure the proper control of the situation.

As showing the variation in these conditions and suggesting a plan of analyzing the several factors that enter the problem of economical management and returns on coal investments, the answer to a similar inquiry published in *Coal Age*, July 22, p. 161, will be of interest, although that reply relates solely to anthracite mining. Another reference to returns in the Illinois district will be found on page 40 of the issue of July 1, 1916.

Examination Questions

Technical Questions That Mine Foremen Should Be Able To Answer

(Suggested by "Coal Age")

Ques.—In order to secure a good average reading in an airway 7 x 8 ft. in section, the anemometer is exposed for two minutes to the passing current. The total reading at the end of this time is 1250. The temperature of the air on the intake at the point of observation is 32 deg. F. Passing into the return airway, the temperature is found to have increased to 65 deg. F. (a) Without making any correction in the reading of the instrument, calculate the volume of air passing on the intake. (b) Assuming there is no gas given off in the mine, what should be the volume of air passing in the return?

Ans.—(a) The sectional area of the airway is $7 \times 8 = 56$ sq.ft. The average velocity of the air current is $1250 \div 2 = 625$ ft. per min. The volume of air passing on the intake is therefore $56 \times 625 = 35,000$ cu.ft. per min. (b) Owing to the increased temperature of the air passing on the return airway, its volume is increased in the ratio of the absolute temperatures. In other words, the volume ratio, for the intake and return airways, is equal to the absolute-temperature ratio. Hence, calling the required volume on the return x , we have

$$\frac{x}{35,000} = \frac{460 + 65}{460 + 32} = \frac{525}{492}$$

$$x = 35,000 \times \frac{525}{492} = 37,350 \text{ cu.ft. per min.}$$

Ques.—Assuming a barometric pressure of 30 in. on the surface, calculate the corresponding pressure at the foot of a shaft 200 yd. deep, taking the water gage on the fan drift as, say 3 in.

Ans.—The increase of barometric pressure, due to a depth of $200 \times 3 = 600$ ft., may be calculated approximately at the rate of 1 in. of mercury for each 900 ft. of depth below the surface. The increase in barometric pressure for a depth of 600 ft. would therefore be $600/900 = 0.67$ in.

But, it is also necessary to calculate the increase in barometric pressure, due to the ventilating pressure indicated by the 3-in. water gage on the fan drift. Since mercury has a specific gravity of 13.6, or is 13.6 times as heavy as water, 1 in. of mercury column corresponds to 13.6 in. of water column; and 3 in. of water is therefore equal to $3 \div 13.6 = 0.22$ in. of mercury. The total increase in barometric pressure, due both to the depth of the shaft and the ventilating pressure is, then, $0.67 + 0.22 = 0.89$ in., which makes the total barometric pressure at the foot of the intake shaft in this case 30.89 in.

Ques.—Under the conditions given in the two preceding questions, find the weight of air passing into the mine each minute.

Ans.—Since the volume (37,350 cu.ft. per min.) was measured on the intake airway, where the barometric

pressure was found to be 30.89 in. and the temperature is given as 32 deg. F., the weight of air passing into the mine under these conditions is

$$W = \frac{1.3273 \times 30.89}{460 + 32} \times 37,350 = 3112 \text{ lb., or say}$$

$$1\frac{1}{2} \text{ tons per min.}$$

Ques.—Referring to the three preceding questions, and assuming that the air entering the mine is half saturated or contains 50 per cent. of moisture, at the temperature of 32 deg. F., (a) find the weight of moisture carried into the mine per hour. (b) Assuming that the return current is fully saturated at a temperature of 65 deg. F., find the weight of water vapor carried out of the mine per hour by the air current. (c) Under the assumed conditions, what weight of water is extracted from the mine workings per hour, by the air current?

Ans.—a. Referring to a table giving the saturated pressures of water vapor in inches of mercury, at different temperatures, the saturated vapor pressure, for a temperature of 32 deg. F., is found to be 0.1815 in., and, for a temperature of 65 deg. F., the saturated pressure is 0.6176 in. Therefore, for 50 per cent. saturation, the weight of water vapor carried by the air current per hour, at a temperature of 32 deg. F., is found by the formula,

$$W = 60 \times 37,350 \times \frac{0.82757 \times 0.50 \times 0.1815}{460 + 32} = 342 \text{ lb. per hr.}$$

b. The weight of water vapor carried in the return current, which is fully saturated at a temperature of 65 deg. F., is given by the formula,

$$W = 60 \times 37,350 \times \frac{0.82757 \times 0.6176}{460 + 65} = 2328 \text{ lb. per hr.}$$

c. The weight of water vapor or moisture extracted from the mine workings by the air current, in this mine, under the assumed conditions, is therefore $2328 - 342 = 1986$ lb. per hr., or practically 1 ton. The weight of water taken from this mine in 24 hr. is therefore 24 tons, which shows the drying effect of an air current entering a mine when partly saturated at a low temperature and passing out of the mine more or less fully saturated at a higher temperature.

Ques.—If the return air current in a mine measures 100,000 cu.ft. per min. and is found to contain 3 per cent. of methane, how much air must be circulated to reduce the proportion of gas in the return to 1 per cent.?

Ans.—The quantity of gas in the return current, at present, is $100,000 \times 0.03 = 3000$ cu.ft. In order that this quantity shall form 1 per cent. of the return current, the volume of air and gas passing on the return airway must be $3000 \div 0.01 = 300,000$ cu.ft. per min. The volume of pure air in circulation will then be $300,000 - 3000 = 297,000$ cu.ft. per min. The original quantity of pure air entering the mine was $100,000 - 3000 = 97,000$; hence the quantity of air to be added is $297,000 - 97,000 = 200,000$ cu.ft. per min.

Coal and Coke News

WASHINGTON, D. C.

The Interstate Commerce Commission has taken under advisement the question of whether it shall seek to solve the car-shortage problem by ordering all railroads to return cars to their owners immediately upon unloading. A hearing was held upon this subject recently, at which time the railroad representatives, headed by W. W. Atterbury, vice-president of the Pennsylvania and president of the American Railway Association, appeared and urged against any action on the part of the commission. The railroad representatives declared that most of the roads were doing their best now to deal fairly with the public, and argued that a hard-and-fast rule by the commission would interfere with operations and make the situation worse.

Commissioner McChord said the railroads seemed to pay no attention to the orders of the railway association, which has adopted various drastic measures to relieve car shortage.

"The railroads," he said, "not only have violated their written and verbal agreements, but they have deliberately been engaged in the pastime of stealing cars from each other."

When Mr. Atterbury objected, saying that this statement could not be accepted as true, Mr. McChord said he had seen a letter from one president stating that other executives were not going to heed the orders of the association's car service committee.

"Don't condemn the whole system of railroads because the present intricate plan is not working as smoothly as we would like to see it," replied Mr. Atterbury. He contended further that the present was no time for an arbitrary order by the commission; that January, February, March and possibly April were months in which railroad operation would be most difficult, particularly as the roads had not had time to work out the new car service distribution plans.

There is no car shortage for normal traffic, Mr. Atterbury insisted, and there should be no hard-and-fast commission order based on an abnormal situation, which, for instance, had transferred the Pennsylvania from a car credit, or business originator, to a distribution system for other lines originating traffic.

Mr. Atterbury said that the railroads do not know what might be done about the refusal of the Grand Trunk system to pay the 75c. per diem increased rate for foreign cars on its line.

"We might," he added, "refuse to load cars into Canada over the Grand Trunk, but that might shut off the coal supply of Canada, which comes entirely from the United States." He said some action might be evolved in Canada to deal with the situation.

New England, the witness said, already had straightened out its traffic and conditions never had been better there. He pointed out particularly what had been accomplished by the New Haven.

All the railroad men scented danger in any commission order because of the law imposing \$5,000 fine for violations of Interstate Commerce Commission orders. W. A. Worthington, vice-president of the Southern Pacific, said the Western lines have a large excess of open cars and a deficiency of box car equipment and that the proposed order, if rigidly enforced, might subject his line to an accumulation of \$23,000,000 in fines.

Shipping Problems To Be Investigated

The Secretary of Commerce announces that Special Agent Grosvenor M. Jones, who has written several important reports on shipping problems for the Bureau of Foreign and Domestic Commerce, will undertake at once for this bureau an investigation of South American markets for coal. The field that he is to study is considered the logical one for the development of the foreign coal trade of the United States, and it is believed that its extension there will be an important factor in building up an American merchant marine.

British economists have stated that the availability of Welsh coal has contributed to the success of England's merchant shipping. The hope was expressed here that similar cargoes may be provided in our trade with South America.

Attention was called to the fact by the department that Latin-America is a promising market for coal, because it has only extremely limited supplies of its own. Chile, Peru and Bolivia in particular need fuel and have an abundance of minerals to ship in return. Nitrates and iron, copper and tin ore can be brought to this country more cheaply if full cargoes of coal can be taken back on the return voyage.

Mr. Jones, it was announced, has been engaged for some time on preliminary work and will start for South America about the middle of January.

HARRISBURG, PENN.

Figures given to Governor Brumbaugh on Dec. 28 by State Chief of Mines James E. Roderick,

who obtained them from official sources, show the extent of the coal industry of Pennsylvania, while they also indicate that the state is making a favorable showing as regards accidents, especially in the bituminous field.

Of the production of 518,000,000 net tons in 1915 for the United States, Pennsylvania mined 247,000,000, or 47 per cent. of the total, while of 767,554 men employed in the nation's mines, 365,073 are in Pennsylvania collieries.

A favorable showing was also made in the bituminous mines in Pennsylvania in the number of fatalities. In the United States, exclusive of Pennsylvania, the number of fatalities was 1,236, or 3.07 per 1,000 employees. The number for each million tons produced was 4.56, and the production for each fatality was 219,493 tons, while in Pennsylvania, where the conditions are much like those existing in other states, the production was 157,420,068 tons, the number of employees 187,734, of which 442 were killed, which equals 2.35 per 1,000 employees, or 2.81 per million tons produced, and 356,154 tons were produced for each fatality. If the fatalities in the United States exclusive of Pennsylvania had been 2.35 per 1,000 employees, as in the Pennsylvania bituminous mines, instead of 3.07, the loss of life in the mines of the United States outside of Pennsylvania would have been 946 instead of 1,236, a reduction of 290. If the fatalities in the bituminous mines of Pennsylvania had been 3.07 instead of 2.35 per 1,000 employees, the number of killed would have been 576 instead of 442, an increase of 134.

The fatalities in and about the anthracite mines are more numerous than in the bituminous mines, but the greater degree of danger does not equal the greater percentage of fatalities, shown to be almost one life for every 1,000 employees as compared with the bituminous fatalities. The conditions, however, are such that the Department of Mines officials say it cannot control them under the present anthracite law enacted in 1891, and it is therefore sincerely hoped that the law will be amended at the coming session of the legislature.

Many Awards Have Been Made

The Commissioner of Labor states that records in the Bureau of Compensation show that from Jan. 1 to Dec. 21, 1916, the sum of \$145,480.55 has been paid to widows and other dependents of industrial workers killed in their employment. Agreements filed during the same period for 1,194 claims provide for the ultimate payment of \$2,860,770, or an average of \$2,395.95 for each agreement approved.

During the first 20 days of December there was contracted to be paid to dependents on account of fatal accidents the sum of \$219,920. In nonfatal accident cases, 51,096 agreements were approved from Jan. 1 to Dec. 21, in which the disability periods ranged from one day to 500 weeks and upon which an aggregate amount of \$1,229,805.32 has been paid, or an average of \$24.06 per case.

From Jan. 1 to Dec. 21 there were 1,717 claim petitions filed in the bureau, and of this number 514 awards were made, 255 were disallowed and 646 were dismissed by reason of agreements being reached by the two parties. On Dec. 21 there were 301 cases in the hands of the 10 referees. There have been 211 appeals taken to the Compensation Board from the referees' decisions and 27 appeals to the Common Pleas Court from the board's decisions.

During the first 20 days of December alone there was paid the sum of \$137,270.45 to disabled workmen. These amounts are in addition to medical bills.

PENNSYLVANIA

Anthracite

Scranton—Six families, comprising 19 persons, residing in the 1200 block of Hampton St. and one family on Landis St. were overcome by illuminating gas early on the morning of Dec. 31, when a main of the Scranton Gas and Water Co. was broken by a mine cave in the Sloan mine of the Delaware, Lackawanna & Western Railroad Co.

Hazleton—Many of the anthracite mines in the Lehigh field were short-handed on Dec. 26 because of the second celebration of Christmas among employees of foreign extraction, who usually stay at home for a double observance. With the mines idle again Jan. 1 and 6 for the Greek Christmas and a week following for the Greek New Year, production will be considerably curtailed throughout the hard coal belt at a time when there is demand for every pound of coal that can be sent to market.

Pottsville—Two miners were killed and two seriously injured by an explosion of gas at the Silver Creek colliery on Dec. 30. The explosion occurred in the east top gangway, temporarily

closing it and imprisoning the men. The two miners were suffocated by black damp, which quickly spread following the explosion. They were not burned by the gas. The explosion was a surprise, as every precaution against gas was observed, the men using electric lights or safety lamps.

Pittston—The Pennsylvania Coal Co. and the Hillside Coal and Iron Co. have paid to all salaried employees bonus checks amounting to 10 per cent. of the annual salary of each official. No previous announcement had been made of the granting of a bonus.

Wilkes-Barre—The Lehigh Valley Coal Co. will distribute a bonus amounting to \$40,000 among its employees, who have been with the company six months or more. Employees drawing \$85 per month will receive a bonus of 10 per cent. of the year's salary, while those earning over \$85 per month will receive 8 per cent.

A unique Christmas present was given the breaker boys of the Kingston Coal Co. When the boys reported for work Dec. 23, instead of going to their places in the breaker, they were taken to various barber shops in Kingston and Edwardsville where their hair was cut at the expense of the company. The older employees also received Christmas presents, but of a different variety.

Dundee Crossing—Fire recently destroyed the large barn on the farm of the Lehigh & Wilkes-Barre Coal Co. of this place. Three pigs, two calves, and seven tons of hay were burned with the barn. The balance of the buildings was saved by the various fire companies that responded to the call.

Bituminous

Uniontown—The Connellsville Coal Co. is taking considerable coal from its stripping recently opened at Morrell. This is a comparatively new method of mining in this region.

Several mines in this region abandoned for years have recently been reopened. Among these are No. 111 mine of the Consolidation Coal Co. near Garrett, and Stoner No. 1 mine at Berlin. The mining companies operating in and around Garrett recently paid their employees a bonus of 10c. additional for each ton mined during Christmas week.

Washington—The coal industry in Washington County is enjoying the greatest boom in its history. There is scarcely an idle mine within the county, and the few that are not running are being put in condition for operation. The same conditions prevail in Greene County.

Sligo—Each employee in the mine of the John C. Graham Coal Co. was recently presented a small diamond pin as a Christmas present. A bonus system is also employed in this operation.

Connellsville—The year 1916 is considered as the most prosperous the Connellsville region ever experienced, while the outlook for the coming year shows no sign of diminution in prosperity. It is said that there is more actual cash money in circulation in the city than ever before. The Christmas layoff relieved temporarily a bad car shortage on the Baltimore & Ohio R.R. An embargo was recently declared by this road on all shipments to Tidewater ports in the vicinity of New York. The estimated production of coke for the week ending Dec. 23 aggregated 333,948 tons, of which the Merchant ovens produced 148,521 tons, and the furnace interests 205,427 tons. This is a total decrease of 41,553 tons.

Charleroi—Coal was recently run over the Charleroi mine tippie of the Voughgheny & Ohio Coal Co. for the first time in years. The loading of one of the large steel barges of the Jones & Loughlin Steel Co. was begun. About half the coal from this mine will be shipped by river for use in the Pittsburgh district.

Somerset—Importation of Mexicans as a means of solving the labor problem in western Pennsylvania is fast proving a failure. In Somerset County of the several hundred Mexicans brought here by the mining companies only a few have been found to be of any value as laborers. The Quemahoning Coal Co. is greatly disappointed with the result of its experiment. The claim is made that Mexicans are not fit for ordinary hard work. They are too lazy. Of the many that have been tried most would rather lie under a tree and make cigarettes than earn an honest dollar. Many of the Mexicans have left. Their principal complaint was the cold weather.

Quemahoning—It is thought that tramps who were loitering about the place caused the fire which destroyed the tippie of the Somerset Smokeless Coal Co. recently. The property was recently sold to Cofroth, Walker & Lafleur, and the

delay caused by the fire will be a great disappointment to the new owners, as they have obtained contracts for the full amount of coal that can be mined.

Spangler—What is said to be the largest price ever paid for coal land in Cambria County was paid on Dec. 30, when representatives of the Blubaker Coal Co. purchased 463 acres of coal land in Barr Township for \$118,000. The price per acre was approximately \$255. The purchase includes the coal, minerals, timber and surface of the land. It gives the new owners two seams of coal, while two seams are reserved to the sellers. Forty years ago this land was bought for \$3.90 an acre. Nine years ago this land was optioned at \$125 an acre, but the holder of the option refused to pay for it, forfeiting \$1,000 paid on the option.

Ebensburg—A mortgage for \$160,000 has been given by the Bird Coal Co. to the Kelso Smokeless Coal Co., covering coal seams, tipples, etc., in Conemaugh and Stony Creek Townships. With this mortgage is a deed transferring title to the Bird Coal Co.

Irwin—Five thousand employees of the Westmoreland Coal Co. have received notice of an advance in wages, effective at once, amounting to from 8 to 10 per cent.

WEST VIRGINIA

Charleston—District Attorney William G. Barnhart has asked the Interstate Commerce Commission to assign two inspectors to his district to assist in an investigation of the car shortage, on the ground that lack of cars is seriously affecting the coal industry of West Virginia. This action, it is understood, has been approved by the Coal Operators' Associations of the southern part of West Virginia. President J. W. Dawson, of the Kanawha Association, declaring that the shortage has cost the members of his association several hundred thousand dollars. The car supply is estimated at only 40 per cent. on the Baltimore & Ohio, Chesapeake & Ohio and Norfolk and Western and 25 per cent. on the Kanawha & Michigan.

Although over 18,000 miners are employed in McDowell County, there were only four fatalities due to mine accidents during the month of November, according to the report issued by the Department of Mines. Kanawha County did not have a single fatality during that period. Twenty-eight deaths occurred in the mines during the month, one-half of which were due to falls of roof and coal. Eight of these occurred in Fayette County. Nineteen of the victims were Americans.

Bluefield—Operators in the Pocahontas field are anticipating normal working conditions shortly. Hundreds of miners who left the field for the holiday season are now beginning to return, and shipments have begun to increase. It is reported that the miners of the Pocahontas field had more money saved for this Christmas than ever before.

Holden—Employees of the U. S. Coal and Oil Co. received Christmas gifts from the firm to a total value of approximately \$50,000. Each office and store man received the equivalent of a month's salary, while a wagon went through the miner's camps delivering to each child various Christmas goodies. In the town of Holden alone, three-quarters of a ton of candy, and 1,500 oranges were distributed.

Welch—The club house of the new Pocahontas Coal Co. of Deegans was totally destroyed by fire Christmas morning. The occupants escaped, but without saving any of their belongings. The cause of the fire is not known, but it is believed to have been of incendiary origin. Loss of the building is said to be covered by insurance. The furniture and fixtures were not insured. It is understood that the club house will be rebuilt immediately.

Fairmont—A coroner's jury, inquiring into the death of L. M. Jones, chief of the mine-rescue car of the Department of Mines, in Mine No. 7 of the Jamieson Coal and Coke Co., rendered a verdict to the effect that Mr. Jones died from the effects of suffocation. Evidence was brought out that Jones, when found, showed all the marks of one having perished from the effect of breathing violently poisonous gases. When his body was recovered and brought to the surface, it was found that he still had a supply of oxygen sufficient for 20 minutes, according to the gage in his oxygen tank.

KENTUCKY

Beattyville—The Warner Coal Co., recently organized to take over the Beattyville Block Coal Co. mines at White Ash, is prepared to begin operations and will start shipping shortly. The mines, though idle for several years, were kept up.

Greenville—Every employee of the W. G. Duncan Coal Co. and the Greenville Coal Co. recently received a \$5 gold coin in his bimonthly pay envelope as a Christmas gift, "in consideration of the good services rendered and in order to promote the continued good feeling existing between employers and their employees."

Whitesburg—Due largely to Christmas and the holidays, some of the coal operating companies in this territory report a shortage of laborers, although hundreds are brought into the field almost every day. Mining activity has been somewhat handicapped for a week.

Fleming—In order to facilitate mining work and development in general in the Towns of Haymond and Hemphill the Postoffice Department announces the establishment of post offices. Cromona will be the name of the office in Haymond and Jack Horn that at Hemphill.

OHIO

Flushing—Meister Bro. are making good headway on their new mine which is being opened at Lafferty. The tippie is up and a small amount of coal is being run. Shipments will be begun as soon as the sidetrack is finished.

Bellaire—The Pultney mine recently had a serious fire. The engine house was burned, which stopped work for the time being. Men were promptly started to work, clearing away the refuse and getting ready to rebuild. This work will be pushed as rapidly as possible, as the mine was turning out a considerable amount of coal per day. The actual loss will amount to several thousand dollars in addition to the time wasted. This amounts to a considerable sum for each idle day.

Athens—On account of the high water in Sunday Creek, mines Nos. 6 and 22 were recently forced to be idle. The water was not entering the mines, but was in danger of breaking in at any time, rendering it dangerous to work.

Mines Nos. 210 and 211 in the Sugar Creek district are in active operation, the men getting regular work at full time, and it is understood that No. 209 will also be placed in operation soon. No. 210 has been averaging 1,250 tons a day and No. 211 is turning out 1,400 tons, and both will increase their output in the near future.

INDIANA

Terre Haute—A recent sudden cold spell swamped Mayor Gossmos municipal coal market. The Mayor was unable to hire enough teams to deliver coal sufficiently rapidly, and orders for 500 tons were quickly piled up. To all the customers who could provide teams, the Mayor sold orders for delivery at the mines. The new strip pit is now producing about 60 tons per day.

ILLINOIS

Hillsboro—The Hillsboro Coal Co. has been selling coal at the mine for use in town and surrounding country at \$2.25 a ton all fall and winter, while at other towns in the county the price has been much higher. Purchasers have driven as far as 15 miles to Hillsboro to take advantage of the low price. The company announces that it will continue to sell at \$2.25 for town and county consumption no matter how high the prices go elsewhere.

Belleville—The International Coal and Mining Co., which operates the Carbon mine at O'Fallon, has appealed to the St. Clair County Circuit Court from the decision of the State Industrial Board, rendered Dec. 5, granting Mike James \$5 a week and \$200 for medical attention because of injuries sustained while working at the mine. The company alleges errors on points of law in the board's ruling. It alleges that James should receive only \$1.96 a week and nothing for medical attention, because that was furnished by the company.

Pana—It is reported here that there is great scarcity of coal at interior towns which have no local coal mines. The operators here have been appealed to, but lack of cars prevents sending shipments. Coal is being hauled long distances by wagon.

Harrisburg—The Wasson Coal Co. has filed two suits in the Circuit Court here against the Big Four railroad company for damages aggregating \$377,000, alleging discrimination in the distribution of coal cars during the present shortage.

Foreign News

British Columbia—After being closed and thoroughly sealed from outside air since 1913 for the purpose of extinguishing a mine fire in the No. 1 coal mine at Corbin, B. C., surface indications show that the fire has not been extinguished, but is spreading at a rapid rate.

Dresden, Germany—In order to put an end to speculation which has prevailed for a considerable time, the State of Saxony is to purchase and own its coal fields. Existing properties privately owned will be operated as before, but they may not be extended nor may other fields be purchased privately. The coal fields of Saxony have for years presented a rich speculative field, and considerable speculation has been indulged in. The public has hardly benefited from this practice.

Personals

W. R. Randolph, of Williamson, W. Va., has leased the old Peach Orchard coal mines at Peach Orchard, Ky., and will resume operation at an early date.

Robert F. Roth has been appointed chief engineer of the E. E. White Coal Co. at Glen White, W. Va., to succeed C. R. Stahl, recently promoted to assistant general manager.

R. C. Bargo, for the last year superintendent of the Moss Coal Co., at Meldrum, Ky., has severed his connections and accepted a position with the Ohio and Kentucky Coal Co., of Cincinnati.

Yuan Tsai, of Hong Kong, China, a graduate of the Massachusetts Institute of Technology and of Columbia College, is spending three or four months in the anthracite and bituminous coal regions investigating modern methods of mining with the anticipation of applying American improvements to China's mining industry.

C. W. Nelson, former vice-president of the Cotton Belt R.R., has been selected by the Commission on Car Service of the American Railway Association to deal with the car shortage situation in Western territory. Headquarters have been established in the Railway Exchange Building, St. Louis, at which reports will be received from the territory west as far as Denver, southwest as far as El Paso and including all the railroads of Mexico.

W. B. Nicol, general sales agent, and W. M. Campbell, vice-president, of the Seneca Coal Mining Co., have resigned their positions and have started in business under the title of W. B. Nicol & Co., at 646 Ellicott Square, Buffalo, N. Y. I. A. Shaffer, Jr., secretary and treasurer of the Falls Creek Coal Co., of Lock Haven, Penn., will also be associated with them. This company will do a general jobbing business in coal and coke, and already has the exclusive sale of the product of several mines.

Robert Warman, of Uniontown, Penn., a former Burgess of the town and still a member of the Fayette County bar, will shortly start work in the Revere mine of the W. J. Rainey Co. Compelled to make his own living at an early age, Mr. Warman, while working as a miner, laid aside enough to educate himself and take up the study of law. For 14 yr., with the exception of the four which he served as Burgess, Mr. Warman practiced law in Uniontown. During the past year he has practiced law but has decided that he can make more money in the mine. Miners in the vicinity of Uniontown have been earning about \$50 a week.

Obituary

P. H. Carroll, vice-president and general manager of the Taylor Coal Co., the largest mining company in southern Illinois, with headquarters at Herrin, died on Dec. 26 in a hospital at Chicago, where he was operated on for enlargement of the liver. Since the organization of the Taylor Coal Co. Mr. Carroll has been in charge of its mines, which now number five in Williamson and Franklin Counties. For several years previous he was the general operating manager of the properties in Williamson and Jackson Counties of the Big Muddy Coal and Iron Co. of St. Louis, and was one of the best-known operating officials in southern Illinois. The remains were taken to his former home in Charleroi, Penn., for interment. He was 52 years old and unmarried.

Industrial News

Marietta, Ohio—Fifteen barges of coal recently sunk in the Ohio river while attempting to pass the foot of Manchester Island. The loss was between \$15,000 and \$30,000.

Ridgway, Penn.—It is reported that the timber lands of Trout Run, in this vicinity, are now about cut off and the underlying coal is to be developed at once. The coal is of excellent quality.

Benton, Ill.—The Keystone-Big Muddy Coal Co.'s mine was recently sold at a bankruptcy sale to George J. O'Brien of Pittston, Penn., for \$24,500. This mine has a capacity of 2,000 tons per day.

Greensburg, Penn.—A deal was recently completed whereby the Greensburg Coal Co. purchased 210 acres of coal in Hempfield Township from the Keystone Coal and Coke Co. The consideration was \$212,998.50.

Martins Ferry, Ohio—The Fairpoint and West Virginia Coal Co., recently took over the properties of the Pittsburgh Block Coal Co. This firm has about 50 men working, but the new owners plan to employ 500 men shortly.

Johnstown, Penn.—A considerable tract of coal land in the vicinity of Dilltown, Indiana County, was recently sold to the Cramer Coal, Coke and Stone Co. It is said that this firm will soon develop the tract and that a modern plant will be built.

Charleroi, Penn.—The Warner-Leonard Coal Co. will shortly abandon its Kinder mine at West Brownsville and begin opening a large coal tract about three miles west of Charleroi,

Work will be started at once on the construction of 500 coke ovens, to be completed by June 1.

Uniontown, Penn.—A deal was recently consummated in McClellantown, whereby the Puritan Coke Co. became the owner of the coal under the properties of M. H. Huhn, J. C. McCombs, and others. A considerable area of coal is involved, the price per acre being approximately \$1700.

Detroit, Mich.—The coal contained in the wooden barge "Santiago," which was recently stuck in Lake St. Clair by ice, was purchased by the Detroit Edison Co. The barge was raised, and the coal delivered at the purchasing firm's River Rouge Plant. The barge was raised by the Reid Wrecking Co.

Oil City, Penn.—Eighty-three bags of coke totalling 8100 lb. in weight, were recently received at the Oil City office of the American Express Co. for shipment to a manufacturing plant in Stoneboro. This is believed to be the first instance in this section where coke has been shipped by express.

Uniontown, Penn.—J. M. Ross, of Masontown, recently sold 13 acres of land mostly underlaid with the 9-ft. Pittsburgh bed of coal in German Township, to Charles E. Bortz, of Menallen Township. The price paid was \$21,000. The purchaser bought the property for development and will open a coal mine at once.

Scottdale, Penn.—A. C. Stickel of Connellsville, Penn., Charles Loucks and Carl F. Keck of Scottdale, Penn., have purchased a tract of 9-ft. Connellsville coking coal near Scottdale and are opening a mine. Shipments will be made via the Pennsylvania R.R. and will start about Feb. 1. Mr. Keck is general manager.

Charleston, W. Va.—It is reported that negotiations have been closed for the sale of the Coal and Coke Ry., running from Charleston to Elkins, W. Va., to the Baltimore & Ohio, and that the purchasing company proposes to place the property in good shape to serve as a means of developing a large territory which is traversed by it.

Gary, Ind.—The shortage of coal has caused a suspension at evening schools, while the supply for domestic use is becoming small. The coke ovens, steel mills and factories at Gary require 25,000 tons of coal each 24 hours, and the necessity of having to draw on reserve stocks so early in the winter is causing considerable concern.

Washington, Penn.—Cyrus Ferguson, of McDonald, who recently took over the holdings of the Rex Carbon Coal Co., near Avella, recently closed a deal by which he purchased 1,400 acres of coal land adjoining that of the Rex company's original holdings. This deal comprised eight farms, and the price paid was \$100 per acre.

Buffalo, N. Y.—Receipts of iron ore by lake have been increasing at this port rapidly for some years, but the amount for the season of 1916 just past is far in excess of any former one, being 7,327,462 gross tons, as against 5,328,608 tons in 1915 and 2,882,030 tons in 1914. There is at present no particular excess amount on the ore docks.

Norfolk, Va.—On Jan. 1, 1917, the Leckie Coal Co., Inc., took over the business of the West Virginia Pocahontas Coal Sales Corp., the officers of the new company being the same as in the old corporation. The new company will represent more mines, and have a larger capital, which will enable it to better care for its customers.

Charleston, W. Va.—Negotiations for the sale of the Coal and Coke Ry., extending from Charleston to Elkins, to the Baltimore & Ohio R.R., are reported as being closed, while it is said that part payment has been made on the property. It is expected that unusual developments will start in the coal and timber field traversed by this road.

Kansas City, Mo.—A report has been received here that mining operations will be started 18 miles southeast of Parsons, Kan., in an effort to open a 4-ft. vein which is believed to be situated at a depth of 80 ft. Heretofore all the veins in that section have been operated by the stripping process, and if this vein materializes it will be the first of the kind in that locality.

Harrisburg, Penn.—Suits will be begun as soon as M. J. Brennan, P. C. Fenton, A. B. Laub and Evan Evans, mine inspectors-elect from Schuylkill, take office. Although the law requires the same qualifications for a candidate at the primaries as at the general election, it is alleged all these inspectors were nominated before the examination board acted on their applications for qualification.

Fulton, Mo.—In the mines of Missouri, mules continue to lead in the haulage. Of considerable interest to the operators of the states in the Middle West is the rising value of mules. The sales in Callaway County are averaging \$230 a head for mules by mule dealers, who in turn sell to operators in the different states. A few years ago a good mule could be bought for from \$100 to \$125.

Johnstown, Penn.—James A. McClain, representing the Blubaker Coal Co. of Spangler, recently purchased 463 acres of coal land in Barr Township of Cambria County, for \$118,000. The price paid per acre was approximately \$225, the

sellers having paid \$3.90 per acre 40 yr. ago. The sellers also reserve two beds of coal. It is said that the Blubaker firm will develop the tract in the near future.

St. Louis, Mo.—The issue of a railroad's responsibility for diverting to its own use coal shipped to another consignee is raised in a suit which has been filed at Belleville, Ill., by the Kolb Coal Co. against the Baltimore & Ohio Southwestern Railroad Co. The petition states that the Kolb company shipped from its mines 14 cars of coal which the railroad company failed to deliver and diverted to its own use.

Youngstown, Ohio.—Several of the large blast furnaces operated by steel mills in this vicinity, including three of the Carnegie Steel Co., have been banked as a result of the shortage of coke, due to the car shortage and freight congestion. Finishing mills at the Republic Iron and Steel Co.'s plant and sheet mills at the Youngstown Sheet and Tube Co.'s plant have also been closed during the holidays for the same reason.

Morgantown, W. Va.—The Lehigh Coal Co. properties about eight miles from this city near Round Bottom, consisting of 150 acres of Pittsburgh coal and 140 acres of Sewickley coal, were recently sold for \$52,202.77. The actual purchase price will be much more, since the purchasers take over various liabilities, while royalties will eventually reach \$362,500. The entire deal according to the contract is to be settled and all payments made within 30 days.

Cincinnati, Ohio.—Leave has been granted by the United States District Court to the receivers of the Cincinnati, Hamilton & Dayton Railroad Co. to sell the company's holdings in the Tuxhorn Coal Co., of Keys, Ill., to J. W. Jefferson, of Springfield, Ill., for \$20,000. The securities are in the possession of the Baltimore & Ohio Railroad Co. as pledges for a loan made to the C., H. & D., and that company has consented to accept the cash from the sale in satisfaction of the debt.

Charleston, W. Va.—It is reported that railroad companies which own coal lands in West Virginia, either directly or through subsidiary companies, may be induced to open important territory soon. A movement has been started to bring about a change in the prices charged by the mining companies for coal used by the railroads. It is thought that the railroad companies are long will be confronted with a decided advance in prices when they attempt to renew contracts.

Tulsa, Okla.—A general shortage of fuel throughout the country has resulted in an unprecedented demand for Tulsa County coal, and every mine in the county is working full capacity in order to fill the orders that are pouring in. Eight mines have been opened in this county and by summer two more will be in operation. Most of the surface coal in this county has been mined and the miners are now operating in removing a vein found at a depth of about 100 ft.

St. Louis, Mo.—L. V. Walcott, appraiser of the estate of the late Edmund C. Donk, of St. Louis, has filed a report in the County Court at Belleville showing that the estimated value of the estate is \$329,148.56. The inheritance tax is placed at \$1,831.24. The report was accepted by County Judge Messick, but attorneys representing heirs say they will file objections. They claim that railroad stocks owned by Missouri corporations, which form a great part of the estate, are not subject to the inheritance tax in Illinois.

St. Louis, Mo.—Henry R. Weisels, a prominent real estate man, has issued an appeal to civic bodies to abate prosecutions against coal users for violations of the smoke ordinance, on the ground that the cost of smokeless coal is prohibitive or the fuel cannot be had at all. He gives comparative figures, showing that Pennsylvania hard coal was \$7.50 last year and is \$10 this year, coke was \$5.75 and is \$6.75, byproduct was \$6.50 and is \$7.50, West Virginia smokeless was plentiful at \$5.50 and is now \$8.25 and cannot be had.

St. Louis, Mo.—Charges against the Big Four railroad of discrimination in the distribution of coal cars were given a preliminary hearing before the Illinois Public Utilities Commission a few days ago. As several questions of interstate importance were found to be involved the commission adjourned the hearing until such time as the Interstate Commerce Commission can be represented. The Illinois body will suggest that the Interstate Commerce Commission send a representative to a hearing to be had Jan. 22 at Harrisburg, Ill.

San Angelo, Tex.—Coal shortage on the Kansas City, Mexico & Orient Ry. has become so acute that train service is threatened. Several loaded fruit trains from California to the East are standing on the track between here and Alpine, due to shortage of fuel to operate the trains. The situation in San Angelo is also acute, as there is absolutely no coal to be had in the city. The Board of City Development has telegraphed an appeal to F. G. Pettibone, vice-president and general manager of the Santa Fe, asking him to operate special fuel trains to relieve the situation.

Birmingham, Ala.—The Birmingham Fuel Co. has acquired the Castella operations of the Black Diamond Coal Mining Co., on the Jager seam, in Walker County, and will greatly increase the

production from this opening. The Birmingham Fuel Co. has recently secured a contract from the New Orleans Railway and Light Co. for an indefinite period, calling for deliveries of approximately 15,000 tons monthly, which, in addition to other large contracts now held, could not be taken care of at the Townley mine of this company, which accounts for the taking over of the Castella mine.

Peoria, Ill.—The sudden instructions to practically double the size of the new yards and roundhouses near here of the Santa Fe system lends color to the report from St. Louis that the Santa Fe will either take over or obtain control of the C., P. & St. L. R.R. and thus obtain an inlet to St. Louis from the East. This will give it an Eastern and Western connection there. Peoria is the northern terminus of the C., P. & St. L., which road has never been a financial success. There are several coal properties on its line and it used to be an extremely heavy carrier, but this traffic has grown lighter with the years.

Columbus, Ohio.—Six creditors of the Sunday Creek Coal Co. have filed a petition in the United States Court at Columbus asking that the Sunday Creek Coal Co. be declared a bankrupt under the Federal law. It is alleged in the petition that on Dec. 19 the Court of Common Pleas named John H. Winder receiver, and since that time the company has transferred property to the Webster Manufacturing Co., the petitioning creditor in the former case. Upon agreement of the parties to the suit no receiver will be named until the concern has been declared a bankrupt. The six creditors represent claims against the concern amounting to \$33,815.

Connellsville, Penn.—It is rumored that another immense coal deal will shortly take place. It is said that the Consolidated Coal Co. is a probable purchaser of the entire West Virginia holdings of Josiah V. Thompson, of Uniontown. These holdings comprise 84,000 acres, which, at \$150 per acre, would amount to \$12,600,000. This would be the largest deal in the history of the coal industry. It is believed to be desirable to dispose of Thompson's West Virginia holdings in bulk, since otherwise this property would be thrown on the market in small acreages to satisfy individual claims against Mr. Thompson.

Columbus, Ohio.—According to a statement issued by Secretary B. F. Nigh, of the Michigan-Ohio-Indiana Coal Association, the year 1916 was the best in the history of the organization. A large increase in membership was made, despite the doubling of dues announced about the middle of the year. The increase in membership was the result of a vigorous membership campaign. During the year Mr. Nigh collected in excess of \$1,200 for members as claims against railroad companies. Mr. Nigh is now started on his 1917 year-book, which will be issued early in the year. The usual midwinter meeting of officers and directors, usually held in January, has been postponed until some time in February.

Boston, Mass.—The Massachusetts High Cost of Living Commission, appointed by Governor McCall, has just made its report on the coal situation. Its investigation was confined to the anthracite industry. The principal recommendations of the commission are Federal regulation of the sale and distribution of anthracite coal, state supervision of the sale of coal and coke for domestic purposes, preparation for speedy shipment of coal from mines in special trains if the occasion arises, separation of anthracite coal business from railroad control, regulation of prices at which coal is sold to mining companies or their agents, the sale of coal in 25-lb. lots at ton rates, that gas companies be required to give preference to orders for coke in 100-lb. lots or less, and that investigation be made of the feasibility of municipal coal pockets. The commission severely scored the apparent discrimination against New England by some of the anthracite companies, who have, it is alleged, curtailed their shipments to this section during the past year in the interests of the railroads that could secure a larger haul and more revenue by delivering coal elsewhere.

Toledo, Ohio.—Toledo is to become the greatest coal shipping point in the country, if the present plans of railroads do not miscarry. Officials of the Chesapeake & Ohio announced a few days ago the purchase of harbor frontage adjoining the Hocking Valley loading docks. Massive loading machinery will be erected on the new property which will make the docks capable of caring for an increase of 2,000,000 tons of coal annually. The C. & O., has also completed plans for entering Toledo direct from the West Virginia coal fields. This will bring an additional 2,000,000 tons of coal yearly to the city. It is announced that the company's coal business direct to Toledo will open Feb. 1. Toledo, it is stated, will be shipping about 7,000,000 tons on lake steamers next summer. Streams of coal cars will be daily pouring into the city in addition to the coal used for commercial purposes in the city itself. With the Hocking, C. H. & D. and C. & O. docks, Toledo will have more coal loading equipment than any city in the country. There is a rumor, unverified, afloat here that this move presages the consolidation of the Hocking Valley and the C. & O., doing away with the Hocking Valley as a separate entity.

Market Department

GENERAL REVIEW

Anthracite—The opening week of the year finds less anthracite at the distributing centers than ever before at this time of the year, while consumption has been at a maximum rate due to storms and cold weather. The shortage has been further accentuated by the protracted cessation of operations in the mining regions, congestion and delay in transportation, and difficulties occasioned by frozen coal. Consumers' stocks, particularly those who buy early in the season, are generally at a low point, though they are displaying a commendable patience, and there is little anxiety in this quarter. Dealers' supplies are equally low, but they are more alive to the possibilities of the situation, and are making the most vigorous efforts to accumulate some reserves. Offers of premium prices are more general and at a higher level than at any time this season, and bids on some public contracts over the next year indicate the firm attitude of the producing interests as to the future. Conditions in Canada are becoming so desperate that one of the roads in this country was obliged to send a heavy coal train under its own motive power direct into Toronto to relieve a threatened famine.

Bituminous—The restricted production over the holiday period and severe congestion on the railroads have stiffened the market up very sharply, and our average price of 12 representative coals has advanced to a new high level for the season, being fully 20c. per ton above the previous record made on Nov. 25. The current situation is very tense, and may shortly become acute unless there is a very material improvement in transportation conditions. Interest is now centering largely on new contracts, which are involved in many uncertainties. Buyers who have been holding off in anticipation of lower prices, are obviously less confident, and are more inclined to enter into negotiations. One of the largest companies has announced a base price of \$3.50 to its regular customers, though with the restriction that only a half of the previous tonnage will be taken. Bids on a city contract at Philadelphia, involving more than 100,000 tons, showed a minimum of about \$3 per ton. It is evident that the producer's attitude toward new contracts is very firm.

Ohio Valley—Inadequate car supply, railroad embargoes, and scarcity of miners, combined with an increased domestic consumption, due to the recent low temperatures, and a continuance of the very urgent demand for manufacturing and industrial purposes have combined to force prices up to the previous high level once more. Some roads have been obliged to confiscate considerable coal in order to keep their trains moving. The recent big snowstorm has also tended to stimulate the consumers interest, and made him more willing to meet the high prices now asked. Negotiations on new contracts are apparently hanging fire due to the extraordinary high prices now prevailing, though there has been very considerable discussions. At the moment it appears that Pittsburgh district prices for the year beginning Apr. 1 will range between \$2.75 and \$3 per ton. Two short-term contracts involving relatively small tonnages, have been concluded by the City of Columbus at \$4.65 and \$5.10 per ton respectively.

Middle West—A restricted production over the holiday period, together with the cold weather and a further tightening in the car supply, has stiffened the market up very appreciably, forcing prices to the highest level yet attained, and causing a critical situation in the fuel supply question at some points. In spite of an urgent demand from Ohio points, operators are unable to ship in that direction because of the congestion there, while some small communities on certain lines in this section have been cut off so completely that they are hauling coal across country from other railroads where the situation is better. Some roads are becoming very hard pressed for engine fuel, and are confiscating considerable tonnages, with the result that operations at a number of industrial plants are seriously threatened. Chicago has been hard-pressed for coal for some time, and sections in the Northwest ordinarily supplied with Lake coal are beginning to draw heavily on the Middle Western districts for supplies.

A Year Ago—Firm situation continues in anthracite, with supplies notably short. Bituminous still advancing with interior coal going to Tidewater. Activity in industrial operations forces manufacturers to buy. Heavy stocking operations in the Middle West.

Comparative Average Coal Prices

The following table gives the range of mine prices in car lots per gross ton (except where otherwise noted) on 12 representative bituminous coals over the past several weeks and the average price of the whole group for each week:

	Last Year	Jan. 6	Dec. 30	Dec. 23	Dec. 16	Dec. 9
Boston						
Clearfields.....	\$2.75@3.25	\$4.75@5.60	\$4.75@5.75	\$4.75@5.75	\$4.75@5.75	\$4.75@5.75
Cambrias and Somersets.	3.00@3.40	5.00@6.00	5.25@6.25	5.25@6.25	5.25@6.25	5.25@6.25
Pocah. and New River ¹	2.80@2.90	7.00@7.50	7.25@8.00	7.00@7.50	7.00@7.50	7.00@7.50
Philadelphia						
Georges Creek.....	3.00@3.25	6.50@6.75	6.00@6.25	6.00@6.25	6.00@6.25	6.00@6.25
W. Va. Freeport.....	2.50@2.60	5.75@6.00	5.00@5.25	5.00@5.25	5.00@5.25	5.00@5.25
Fairmont Gas mine-run	2.00@2.10	5.75@6.00	5.25@5.50	5.25@5.50	5.25@5.50	5.25@5.50
Pittsburgh (steam coal)²						
Mine-run.....	1.50@1.75	5.00@5.25	4.25@4.50	4.25@4.50	4.00@4.25	4.25@4.50
1-in.....	1.60@1.85	5.00@5.25	4.25@4.50	4.25@4.50	4.00@4.25	4.25@4.50
Slack.....	1.50@1.75	4.95@5.05	3.50@3.75	3.50@3.75	3.50@3.75	4.00@4.50
Chicago (Williamson and Franklin Co.)³						
Lump.....	1.65@1.75	4.00@4.50	3.75@4.50	3.75@4.25	3.00@3.50	3.50@4.00
Mine-run.....	1.10@1.15	4.00@4.25	3.75@4.00	3.50@3.75	3.00@3.25	3.50@4.00
Screenings.....	.90@.95	4.00@4.25	3.75@4.00	3.50@3.75	3.00@3.25	3.50@3.75

Gross average³..... \$2.02@2.22 \$5.16@5.53 \$4.73@5.19 \$4.67@5.08 \$4.48@4.90 \$4.69@5.15
¹ F.o.b. Norfolk and Newport News. ² Per net ton. ³ The highest average price made last year was \$4.80@5.33 made on Nov. 25.

BUSINESS OPINIONS

Iron Age—The new year opens with the pressure upon steel works and blast furnaces in no degree relaxed and with a notably large inquiry for ship plates, 150,000 tons being now before Eastern mills. At the same time the difficulties of production and of moving mill products have grown more acute, curtailment of output amounting in some cases to 25 per cent. Many more blast furnaces have had to bank in the past week, after a precarious operation in most of December. Central Western furnacemen are meeting in Cleveland this week to discuss measures of relief.

Dun—Results during 1916 surpassed the most sanguine expectations, evidence of the unexampled business being found in every statement that appears. It has been a period of unprecedented achievements in finance, trade and industry, with the maintenance of consumptive demands in record volume, notwithstanding the highest prices of modern times, the outstanding feature. The year closed, however, with rather general abatement of purchasing, and with the question of future readjustments entering more largely into calculations. Commercial failures this week in the United States, as reported by R. G. Dun & Co., are 254, against 285 last week, 293 the preceding week and 366 the corresponding week last year. Failures in Canada number 27, against 28 last week, 24 the preceding week, and 36 last year.

Bradstreet—A lull in trade is evident, and the final week of the year provides a breathing spell at the end of twelve months of unparalleled activity in practically every line of trade and industry. Post-holiday influences, inventorying, continued peace talk, price uncertainties and car shortages are the immediate factors that have superinduced slower movements or produced a greater degree of conservatism as regards buying, for future delivery. Holiday trade with retail dealers reached record proportions, and cold weather over a wide area has further reduced stocks of seasonable goods.

Dry Goods Economist—Inquiries made last week in many centers indicate that the holiday trade throughout the country reached exceptionally large proportions. All the concerns heard from say it was larger than they ever enjoyed. While increase in prices was a factor in swelling the sales volume, the gain is attributed chiefly to the greater number of customers and their larger purchases.

American Wool and Cotton Reporter—The principal feature of the week has been the assembling of large and scattered lines of scoured wools in strong hands at advanced prices. At this early date the trade is not ready to discount the effect of a possible tariff on wool. Owing to the holiday week the volume of transactions has been smaller, but the market is strong.

Marshall Field & Co.—Wholesale distribution of dry goods for the week was in equal volume to the corresponding period of a year ago. Many large buyers have attended the market during the week in preparation for January sales. Reports from over the country indicate that retailers have had an excellent holiday business. Collections are in excess of the same period last year.

Atlantic Seaboard

BOSTON

Pocahontas and New River very close-hauled, with little spot business. New England consignees anxious due to slow movement and light receipts. Georges Creek and Pennsylvania grades unchanged. Anthracite distributors worry over slow shipments.

Bituminous—The Hampton Roads situation continues strained, but as yet without any acute developments. Receipts at the piers are sufficient to clear cargoes in from two to four days on the average. Commitments are such, however, with the holiday suspension in mining and other conditions to face that the agencies are still most conservative in accepting boats. The railroads, too, are keeping in close touch with shippers' obligations in the effort to make the irregular car service as effective as possible. Spot coal is chiefly conspicuous by its absence, and while the range of prices is somewhat modified quotations are heard less frequently. Boats are so difficult to get for Hampton Roads charters that the demand for spot coal is only scattering and there are few inquiries of any kind in the f.o.b. market. Requisitions from abroad are sufficient to sustain the same lack of interest in the coastwise market that has been characteristic of coal shippers throughout 1916.

No progress can be reported on season contracts from Apr. 1. It looks as if the producing and selling interests would be willing to drift and watch developments. There are so many uncertain elements in the situation that there appears to be no very well defined procedure that is likely to be followed. The thought that the Government may step in to regulate car distribution more effectively or that rival interests may again war for business via New England re-handling plants is enough to keep purchasers from tying up on hard and fast contracts.

There seems no question that export business is going to be very heavy, provided enough ships can be found. This feature will be watched closely the next month or two, and on developments with respect to British-owned bottoms and whether ships now under construction in American yards are to be retained in coastwise freighting or sold to foreigners will depend the attitude of the Pocahontas and New River shippers toward New England trade. This situation ought to shape itself somewhat during January.

Only small tonnages are sent forward by the Georges Creek shippers, and mostly via Baltimore. There are scattering receipts at New York and Philadelphia, but the principal distributors are still far behind on their contracts. Nothing is heard on next season business on this grade, although the expectation is that after the 1916 experience the leading factors will prefer not to sign up any very comprehensive tonnage.

A few important Pennsylvania operators are looking over the ground in an attempt to take on business for twelve months, if not from April then from Feb. 1 or Mar. 1. Car-supply

continues most erratic and mining interruptions are frequent because of difficulties with labor or the lack of miners. What few season orders have been closed on a basis from \$3@3.25 are in some cases being taken subject to a mining clause providing that in case of any advance being paid to miners a proportionate charge will be added to the price which the buyer will be obliged to pay.

"Market cargoes" continue to come forward from New York and Philadelphia and apparently they are readily absorbed by consignees who have been disappointed by their regular contractors.

Bituminous at wholesale is quoted about as follows, f.o.b. loading ports at points designated, per gross ton:

	Clearfields	Camb. & Somerset
Philadelphia	\$5.90@6.75	\$6.25@7.25
New York	6.10@7.00	6.35@7.40
Baltimore		
F.o.b. mines	4.75@5.60	5.00@6.00
Alongside Boston (water coal)	8.25@8.75	8.50@9.00

Poconos and New River are quoted at \$7@7.50 f.o.b. Norfolk and Newport News, Va., for spot coal, and \$9.25@9.75 on cars Boston and Providence for inland delivery.

Anthracite—Shipments are still exasperatingly slow. Dealers are kept on the anxious seat all the time and the only encouraging thing is that every week sees the spring that much closer. The weather has been very unfavorable to the movement of what few barges are now supplying this market and in consequence receipts have been extremely light. Most retailers are doing business on one or two sizes like egg and chestnut or chestnut and pea, the proportion of broken and stove being very small.

When barges are at length assigned to Eastern dealers the loading is desperately slow. A big local demand at loading points is partly responsible together with the heavy holiday traffic on other freight. All-rail movement is slightly improved. More or less is heard about cars being held in transit or at destination "to order," but the few instances reported are not really significant, other reasons entering into it than any attempt to secure better prices.

NEW YORK

New York Tidewater practically clear of anthracite. Condition unprecedented for this season. Heavy demand continues and prices hold firm. Bituminous in good demand with short supply. Very little free coal to be had.

Anthracite—The new year opened under unusual conditions at the New York Tidewater. There was less anthracite on hand at the piers than at any previous first of the year within memory and prices for individual product were the highest. Demand continues heavy and shipments ended the old year with little or no coal on hand. The situation was much more aggravated by continued cold weather and heavy consumption while storms froze the coal in the cars, making loading difficult and in some instances it took from ten days to two weeks to load a boat.

Although reports from New England show that at least two of the railroads carried more anthracite into those states last year than in 1915 there is a continued urgent demand for coal though the situation may be eased by a modification of embargo orders which went into effect on Dec. 31.

Retail dealers continue to hesitate before paying the high prices demanded for individual coal and only those who must do so are entering the market. Several of the smaller yards, especially in Brooklyn, are bare of coal. Following last week's cold wave and the rise in wholesale prices, some of the retail dealers who bought coal at the new rates made an increase in the retail prices.

Broken, egg, stove and chestnut coals continue scarce. Pea coal is in heavy demand and quotations for the individual product are 50c. higher than the previous week.

The steam coal situation is becoming grave. All three coals are scarce and users of buckwheat No. 1 are now picking up all the rice and barley available. Rice is practically out of the market and barley which is always more or less plentiful is gradually being cleaned up.

One of the city departments opened bids last week for 22,700 tons of Nos. 1 and 2 buckwheat and received only one bid which was \$7.69 per ton.

Current quotations, per gross ton, f.o.b. Tidewater, at the lower ports are as follows:

	Circular	Individual
Broken	\$4.95	
Egg	5.45	\$8.50@9.00
Stove	5.70	8.50@9.00
Nut	5.75	8.50@9.00
Pea	4.00	6.00@7.00
Buck	2.75	5.50@6.00
Rice	2.20	5.00@5.50
Barley	1.95	3.75@4.00
Boiler	2.20	

Quotations at the upper ports are generally 5c. higher on account of the difference in water freight rates.

Bituminous—Demand has been heavy and with the mines idle most of the time during the holiday season very little coal has been coming to New York. Some shippers do not look for much improvement during the next two weeks. On the other hand the operators may favor this market because of the high prices prevailing here. Labor appears indifferent and car supply continues bad, few of the mines receiving more than half their full requirements.

Several of the piers are under embargoes. Loading is very slow and shippers complain of delay in making shipments, it taking from ten days to two weeks to load some boats. Loaded bottoms are in good demand and prices are considerably stiffer than for coal at the piers.

Contract making will occupy much attention this month and it is likely that many of the larger ones will be closed within the next couple of weeks. Some buyers have been waiting for the opening of the year expecting prices to be lower but not much improvement is now expected other than the usual seasonal changes. Buyers from New England continue to invade the New York market but shipments by water are slow and uncertain.

Current quotations, per gross ton, f.o.b. Tidewater, for various grades are as follows:

	South Amboy	Port Reading	Mine Price
George's Crk.	\$7.75@8.25	\$7.75@8.25	\$6.50@6.75
Big Vein	7.50@8.00	7.50@8.00	6.00@6.25
Tyson	7.50@8.00	7.50@8.00	6.00@6.25
Clearfield	7.50@8.00	7.50@8.00	6.00@6.25
South Frk.	7.50@8.00	7.50@8.00	6.00@6.25
Nanty Glo.	7.50@8.00	7.50@8.00	6.00@6.25
Som'r. Co.	7.50@8.00	7.50@8.00	6.00@6.25
Que'honing	7.50@8.00	7.50@8.00	6.00@6.25
W. V. Fairm't			
Th'r'qua.	7.50@8.00	7.50@8.00	5.75@6.00
Mine-run	7.50@8.00	7.50@8.00	5.75@6.00
West. Md.	7.50@8.00	7.50@8.00	6.00@6.25

PHILADELPHIA

Anthracite retail trade slows down slightly. Stocks at lowest ebb. Premium sales increase, especially on pea coal. Shippers far behind on orders. Railroads congested in spite of small holiday production. Bituminous prices increase. Small supplies received. \$3.50 contract price announced.

Anthracite—Immediately after Christmas the retail trade fell off somewhat, but judging from the strenuous efforts of the dealers to buy coal it is very evident they consider it only a temporary lull. Indeed it is feared that even with average January weather the market is yet to see its most exciting times. The stocks of the suburban consumers are reported so much reduced by the recent cold spell that the dealers are being called upon to re-fill the bins; especially is this so with the early buyers. This is being done gradually, as no dealer seems willing to furnish a customer with more than a few tons at a time, particularly of stove size.

Undoubtedly this market received less coal during December than the previous month, also considerably less than during December, 1915. The buyers are vigorously calling the shippers' attention to the deficiency, but are receiving so little encouragement they are becoming alarmed. Most of the retail men took their salesmen off the street and few of them will make any effort to secure new business.

Stocks of the retailers are at the lowest point of the season and lower than for many years at this time. Some yards have had so little coal at times that they were actually out of business temporarily. We know of one small yard that has not had any coal for a week and the proprietor had to borrow some from a competitor to heat his office.

Dealers with fair stocks of any of the sizes are now refusing to accommodate their less fortunate competitors which is adding to the general ill-feeling in the business. But notwithstanding all the adverse conditions there is no danger of a coal famine in Philadelphia as it is too close to the coal region to actually suffer. However, if the public should become panic-stricken and people who do not actually need fuel for immediate consumption start to buy, the yards would be cleaned out in a week or two.

The sale of premium coal grows more general and we have heard of instances of \$1.75 in excess of the circular price being asked for single cars of pea coal. Some little tonnage of the prepared sizes is also being disposed of at prices from \$1 to \$1.75 above circular.

The indifferent way in which the public accepted the recent retail increase of 25c. a ton causes the dealers to regret not having put it into effect earlier in the season. As a matter of fact we know of a few dealers who are getting as much as 50c. increase, frankly telling their customers that in order to supply them they must pay the shippers an increased price to obtain the short sizes, such as stove and nut.

The demand for all sizes has increased to such an extent now that there is really none for sale to other than regular buyers. The big companies are hopelessly sold up and are trying by every means to evade further business. From broken down to the smallest steam size there is no free coal. Pea which a few weeks ago was in fair supply is now in sharp demand.

The extraordinary demand for steam sizes continues. The strong call for this class of coal is well illustrated by the bids which were opened by the city this week to cover their year's supply. Several of the very largest companies, the ones who usually take this business, declined to enter any bid at all on buckwheat, and an analysis of the figures bid on rice show that it must have been based on a mines price of \$2 at least, with barley at not less than \$1.25. On the small tonnage of prepared sizes involved it is a remarkable fact that this tonnage was taken by the larger retail men at prices less than the regular retail figures.

Prices per gross ton f.o.b. cars at mines for line shipment and f.o.b. Port Richmond for tide are as follows:

	Line Tide		Line Tide
Broken	\$3.60 \$4.65	Buck	\$2.00 \$2.90
Egg	4.15 5.25	Rice	1.25 2.15
Stove	4.10 5.60	Boiler	1.10 2.00
Nut	4.50 5.55	Barley	1.00 1.90
Pea	2.80 3.70		

Bituminous—With the lifting of the B. & O. R.R. embargo this week prices of all grades took a sudden upturn, particularly the Fairmont coals which advanced \$1 a ton. The increases on the other grades ran from 50 to 75c. With the embargo in effect for almost a week the market was quite bare of coal and with the releasing of shipments the bidding became very sharp. While we quote no price higher than \$6.75, there have been sales at even more than that figure; on several occasions \$7 was realized and even passed, but this was only for small quantities to meet particularly pressing needs.

Even with the embargoes lifted this city is only fairly well supplied with coal, due to short working time following Christmas which has curtailed shipments to the lowest ebb of the season. The immediate future does not seem to hold forth any promise of betterment, at least until the holidays are well passed. The labor element is independent, and while most mines are reported in operation they are far from turning out a normal production. The car movement has also become very slow recently and coal is frequently three to four weeks in transit. The supply of empty cars has dwindled and some operators have been receiving as low as 10% of their quota, although the average is considerably in excess of this.

One of the largest producers had announced a contract price of \$3.50 to cover shipments during the current year from Jan. 1. This price, however, it is understood, will be confined only to their customers and will be made only to cover one-half of the former tonnage. The announcement of this price does not seem to have affected the general contract situation, as very few concerns seem willing to tie up at that figure in the face of present conditions.

This week the City of Philadelphia received tenders for supplying 110,000 tons of bituminous coal to their various pumping stations and the lowest delivered prices were \$1.68, \$4.63 and \$4.49, according to the point of delivery. When it is considered that the freight rate is \$1.60 it can be easily seen that the business has been taken at a remarkably low price considering prevailing market conditions.

The prices per gross ton f.o.b. cars at mines are as follows:

Georges Creek Big Vein	\$6.50@6.75
South Fork Miller Vein	6.50@6.75
Clearfield (ordinary)	6.00@6.25
Somerset (ordinary)	6.00@6.25
West Va. Freeport	5.75@6.00
Fairmont gas, lump	6.00@6.25
Fairmont gas, mine-run	5.75@6.00
Fairmont gas, slack	5.00@5.25
Fairmont lump, ordinary	5.75@6.00
Fairmont mine-run	5.50@5.75
Fairmont slack	5.00@5.25

BALTIMORE

New year opens with record prices on soft coal. Holidays improved the car supply. The year's exports.

Bituminous—The coal trade of Baltimore starts the new year with the highest scale of prices in its history. The big profits of the past few months have also stiffened the attitude of the producers as to contract rates for the coming year. Any good steam coal at tide is worth \$6 or better on a mine basis, and gas coals are commanding from \$5 to \$5.75. The light production over the holidays made it easy for the railroads to get a maximum car supply into the mining regions. There was not enough coal to load, however, to meet demands of consumers and instead of the market breaking it showed signs of stiffening from time to time. Consumers now seeking twelve-month contracts find that they are asked anywhere from \$3 to \$3.75 per ton on a mine basis for coal.

Following are quotations, mine basis to the trade, for coals of interest here for local consumption and export:

Georges Creek Tyson, \$6.25; Quemahoning, \$6; South Fork, \$6; Somerset, \$5.50 to \$6; Clearfield, \$5.50; Freeport, \$5.25; Fairmont gas, ¾, \$5; same, run-of-mine and slack, \$4.75.

Anthracite—With a better supply of all kinds of coal and a rather poor demand, especially from the household trade during the holidays, the hard coal dealers had a chance to catch up on their back deliveries.

HAMPTON ROADS

Usual holiday congestion of vessels. Receipts light and prices slightly easier.

On account of the holidays the terminals are congested with vessels of all classes. This is always the case when no work is done at the piers for a few days. Little mining has been done for the past ten days and receipts are very light on this account. With a normal supply of coal the railroads would have no difficulty in disposing of the accumulation of waiting bottoms. While prices for spot coal do not show the strength of thirty days ago the trade is better satisfied with the present conditions, as many contracts expired on the first of January and the new contract prices are considerably better than those for last year.

The Norfolk & Western, Chesapeake & Ohio and Virginia railways have issued tariffs, effective Feb. 1, increasing the trimming rate on bunker coal from 10c. to 15c. per gross ton. As bunker contracts are closed for the calendar year, and no intimation of this increase was received from the railways, coal suppliers naturally feel that they have been badly treated. The difference of 5c. per ton, if the new rate goes into effect will fall on the coal supplier, as the steamship owner is fully protected by his contract at the rate of 10c. per ton. It is expected that the matter will be carried to the Interstate Commerce Commission.

Total dumpings of the Hampton Roads carriers for the month of December, 1916, were as follows in gross tons:

Chesapeake & Ohio.....	434,956
Virginian.....	341,346
Norfolk & Western.....	455,917

Total..... 1,232,219

The bunker contract price of \$5 per gross ton is now in effect, market prices being as follows: Pocahontas and New River run-of-mine for cargo shipment, both coastwise and export \$6.50/7 per gross ton; bunker coal, \$7.25/7.75 per gross ton plus 10c. trimming; local deliveries on track, \$6.50/7 per net ton. Anthracite, \$9 per net ton delivered.

Dumpings at the Hampton Roads piers for the past several weeks were as follows:

	Dec. 8	Dec. 15	Dec. 22	Dec. 29
Nor. & West.....	155,086	118,293	99,191	101,202
Ches. & Ohio.....	13,999	203,551	96,200	38,234
Virginian.....	54,447	124,349	105,205	98,200
Total.....	223,532	446,193	300,596	237,636

PANAMA CANAL

Fuel movement through the canal for the two weeks ended Dec. 15 was as follows:

Vessel	From	To	Tons
Lewisham	Baltimore	Coquimbo	13,100
Muskegon	Norfolk	Antofagasta	4,788
G. W. Elder	Norfolk	Punta Arenas	1,473
Beckenham	Baltimore	Valparaiso	14,905
Maipo	Baltimore	Huasco	25,600

¹ Coke. ² Coal and coke.

Total shipments through the canal for the month of November amounted to 38,399 tons.

Ocean Shipping

OCEAN CHARTERS

Coal charters have been reported as follows during the past week:

PHILADELPHIA

Vessel	Destination	Tons	Rate
Josey	Havana	1,671	
Wilth. Colding	Antilla	9,312	
Panama Transport	Santiago	2,915	

BALTIMORE

Claveresk	Felton	2,441	
Hostilius	Buenos Aires	2,025	
Clara E. Randall	Christianstad, St. Croix	863	\$7.00
Juan	Truxillo	841	
Lerisa	Banes	1,259	

NORFOLK

Mae	Jamaica	1,281	
Wasana	Rio Janeiro	2,612	

OCEAN FREIGHTS

The tonnage scarcity still continues, and we are having great difficulty in securing steamers for coals to the Mediterranean, River Plate, and West Coast of South America, even at the advanced rates. A few steamers are offering for other destinations, and recent fixtures to the Windward Islands are at rates considerably above previous quotations. The holidays—as is customary at this season of the year—are also interfering with charter negotiations.

We would quote freight rates on coal by steamer as follows:

	Dec. 26	Jan. 2
West Coast Italy.....	\$39.60@42.00	\$39.60@42.00
Marseilles.....	38.40@40.80	38.40@40.80
Barcelona.....	31.20@33.60	28.80 about
Montevideo.....	19.20@21.60	20.40@21.60
Buenos Aires.....	19.20@21.60	20.40@21.60
Rosario.....	20.40@23.00	21.60@22.80
Rio Janeiro.....	16.00@17.00	16.00@17.00
Santos.....	17.00 about	17.00 about
Chile (good port).....	9.00@10.00	9.00@10.00
Havana.....	4.50@5.00	4.50@5.00
Cardenas, Sagua.....	5.00@5.50	5.00@5.50
Cienfuegos.....	6.00@6.50	6.00@6.50
Port au Spain.....	8.00@8.50	8.50@9.00
St. Lucia.....	8.00@8.50	8.50@9.00
St. Thomas.....	8.00@8.50	8.50@9.00
Barbados.....	7.50 about	7.50@8.00
Kingston.....	6.75@7.00	6.75@7.00
Curacao.....	7.00@7.25	7.00@7.50
Santiago.....	6.00@6.50	6.00@6.50
Guantanamo.....	6.00@6.50	6.00@6.50
Bermuda.....	5.75@6.00	5.75@6.00
Vera Cruz.....	8.25 about	8.00@9.00
Tampico.....	8.25 about	8.00@9.00

* Spanish dues for account of cargo. ¹ And p.c.
² Or other good Spanish port. ³ Net.

Note—Charters for Italy, France and Spain read: "Lay days to commence on steamer's arrival at or off port of discharge."

W. W. Battie & Co.'s Coal Trade Freight Report.

VESSEL CLEARANCES

The following vessels have cleared with coal cargoes:

NEWPORT NEWS

Vessel	Destination	Tons
Wien	Havana, Cuba	2,761
Howick Hall ²	Rio de Janeiro, Brazil	6,474
Peter H. Crowell ²	Barbados, B.W.I.	4,312
Stegelborg	St. Lucia, B.W.I.	2,675
Nicolas Cuneo ²	Sagua la Grande, Cuba	800
Ocean Monarch	Mejillones, Chile	6,170
Olaf ²	Curacao, D.W.I.	2,672
Minnesotan	Pearl Harbor, Hawaii	7,989
Peerless	Rosario, A. R.	4,012
Winneconne	Buenos Aires, A. R.	2,407
Heina ²	Antilla, Cuba	4,470
Algonquin ²	Havana, Cuba	2,437
Abbey C. Stubbs ²	Guadaloupe, F.W.I.	495
Dean E. Brown ²	Cartagena, Spain	1,021

NORFOLK

Ulysses ²	Cristobal, Canal Zone	12,033
Llanishen ¹	Genoa, Italy	5,428
Grena	Buenos Aires, A. R.	8,988
Hugo ²	Kingston, Jamaica	2,107
Huffero ²	Havana, Cuba	2,043
Oregon ²	Bu nos Aires, A. R.	7,275
Carmen	Italy—Any port	6,467
Ilford	Iquique, Chile	4,014
Armando	Italy—Any port	7,095
Sverre ²	Rio de Janeiro	5,202
Ericell ²	St. Lucia, B.W.I.	2,583
Strix ²	Buenos Aires, A. R.	2,554
Mary L. Baxter ²	Curacao, D.W.I.	1,463
Sosua ²	Kingston, Jamaica	1,095
Harald ²	Barbados, B.W.I.	4,500
Angola ²	Lisbon, Portugal	5,608
Bertha	Puerto Padre, Cuba	2,011
Bratland ²	Santa Lucia, Cuba	3,308
Ausable	Buenos Aires, A. R.	2,889
Achilles ²	Cristobal, C. Z.	12,018
Rimfaxe ²	St. Georges, Bermuda	1,139

PHILADELPHIA

Elizabeth Weems	Vita, Cuba	9,312
Wilth. Colding	Antilla	510
A. B. Sherman	Martinique	
Tordenskjold	Fort de France	
Durley Chine	Halifax	
Sheba	St. Johns, N. B.	1,341
Panama Transport	Santiago	2,915
Nunalbro	Havana	
Ereaga ²	Valencia	

BALTIMORE

Maumee	Argentina	3,442
Levisa	Cuba	2,563
Claveresk	Cuba	6,100
Juan	Honduras	1,071
Horatius	Argentina	4,214

¹ Pocahontas Fuel Co. ² Berwind-White Co.
³ Castner Curran & Bullitt. ⁴ Baker-Whiteley Co.
⁵ Smokeless Fuel Co. ⁶ West Virginia Coal Co.
⁷ C. G. Balke Co.

COASTWISE FREIGHTS

Sentimentally, freights from Hampton Roads to Boston are much firmer on account of adverse weather, but charters are still very rare; \$2.60 has been reported as a rate, but so far it is not confirmed; \$2 has been offered and declined for 5,000 to 6,000-ton steamers for one trip or several trips, so the market can hardly be said to show any weakness. \$1.25@1.35 is still the current quotation for small barges out of New York for points on Long Island Sound. Takers are few, however, because of the loading uncertainty and the heavy demurrage charges that are so likely to accrue. To Boston, rates are \$2@2.25. All kinds of transportation have been moving slowly for three weeks.

Lake Markets

PITTSBURGH

Shipping conditions somewhat worse. Numerous embargoes. Circular price of \$2.75 in prospect.

On the whole there is no improvement in the transportation situation and in some respects conditions are the worst yet. On some divisions car supplies are averaging a trifle better, but any improvement in that respect is more than balanced by the embargoes which have increased in number.

Labor supplies are somewhat better as the men have gotten back from the Christmas celebration. There remains, however, the celebration of the Greek Christmas, 13 days behind our own, on the Julian calendar. Generally speaking, mines are operating at between 50 and 75% of capacity.

The Pittsburgh & Lake Erie is surrounded by embargoes, and during most of past fortnight it has had to refuse all shipments destined to go off its own tracks. As it has a free movement itself, however, it is serving line consumers well and the steel mills in the Youngstown district that were so short of coal recently are now much better supplied.

While there do not seem to be any active negotiations as yet, it appears very probable that the circular price for mine-run, for the twelvemonth to begin Apr. 1, will be \$2.75, or possibly even as high as \$3. Prices for spot coal vary widely from day to day and from division to division, but a fair average seems to be the same as a week ago, \$5 for slack, \$5@5.25 for steam, mine-run, and \$6@6.25 for 3/4-in. gas, per net ton at mine, Pittsburgh district.

BUFFALO

Bituminous prices stronger. Manufacturers occasionally unable to get all the coal they need. Car situation growing worse. Canadian roads crippled.

Bituminous—The situation grows worse, both for the shipper and consumer. It is more difficult to get cars to destination and embargoes are more frequent. As a consequence the need of supply is growing and there are increased reports of factories shutting down. Consumers of iron find it so difficult to get their orders filled that they decline to consider new business and are often unable to come within several months of filling regular orders.

The big snow storm seems to have created much uneasiness on the part of consumers, who are now more willing to pay the increased prices for coal if it can be had in quantity. The outlook is by no means promising. The chief difficulty with the railroads seems to be a lack of motive power.

The mining districts are still turning out small amounts of coal, on account of the holidays, but consumption is also light. Still the asking prices are insisted upon more generally than heretofore. Slack is about on a par with sizes. Prices vary, but on an average are about in accordance with the following quotations, based on the mine price of \$5.25@5.75 for Pittsburgh three-quarter:

Youghiogheny Gas.....	\$7.00@7.50
Pittsburgh Steam.....	6.50@7.00
Ohio No. 8.....	6.50@7.00
Allegheny Valley.....	6.30@6.80
Pennsylvania Smokeless.....	6.45@6.95
Cambria Co. Smithing.....	6.40@6.90
All Slack.....	6.30@6.80

Anthracite—The situation improves in the city, but not outside. Certain of the standard companies have diverted a great part of the excess Lake coal into the coal trestles and in some instances have furnished more than the retailers could handle. There is clamor for coal here, as elsewhere, but that will continue so long as anybody is short. The shippers are positive that they have gained very materially on the local shortage.

Outside, especially in Canada, the shortage is serious, chiefly because the railroads are not able to move the coal promptly. So deficient are the Canadian roads in motive power that an Eastern coal road lately ran one of its heavy coal trains direct into Toronto, a quite unusual proceeding.

Independent prices have been advanced lately, the premiums asked being in some cases \$3 per ton, though not so many consumers are paying this excess as was the case last fall. The newspaper statements about a big deficiency are not much heard now and the public is less disturbed than formerly. Jobbers are asking a premium of \$3 generally for stove and chestnut and will shade that price if necessary to get the order.

TORONTO, CAN.

Anthracite moving more freely. Serious shortage of bituminous with advancing prices. Coal confiscated by Grand Trunk Ry. New demurrage rates.

The market is now being fairly well supplied with anthracite which is coming forward freely but the situation as regards bituminous shows no improvement and wholesale prices have advanced. Large supplies are held up at Black

Rock by the embargo of the Canadian railway companies which affects all the American lines except the Pennsylvania. The Grand Trunk has confiscated considerable coal which would otherwise have been put on the market.

The new demurrage scale as finally settled by the railway board which went into effect on Jan. 1, remaining in force until Apr. 30, is as follows: Forty-eight hours free time allowed from 7 a.m. of day following arrival after which demurrage rates of \$1 for first day, \$1 for second day, \$3 for third day and \$5 for fourth and succeeding days. Dealers do not anticipate that the adoption of the new scale will have much effect, as the trouble is stated to be due to a shortage of locomotives as well as of cars.

Quotations for best grades per short ton are as follows: Retail anthracite, egg, stove and nut, \$9; grate, \$8.75; pea, \$8; bituminous steam, \$11, slack, \$9; domestic lump, \$10; cannel, \$10. Wholesale f.o.b. cars at destination bituminous three-quarter lump, \$9, slack, \$9.

DETROIT

Insufficient supply of steam coal handicaps industrial plants. Domestic consumers find supplies low. Lake shippers delay 1917 contracts.

Bituminous—The newest development is that all shipments from Cincinnati to Detroit brokers have been embargoed though coal consigned to consumers is eligible for delivery it being intended to prevent holding coal on track for speculative purposes. Similar measures are reported at Toledo, Cleveland and several other cities. Steam consumers are buying eagerly when the opportunity offers at prices ranging from \$4.50 to \$4.75 at the mines, but only small quantities are available. In the effort to assist in relieving the car congestion the plant of the Ford Motor Co. was closed during the holidays and quite a number of other industrial establishments were operating only part time. Considerable progress has been made in unloading loaded cars here. Temperatures around the zero mark have brought a renewal of the urgent demand on retail yards for domestic coal. Quite a number of the yards are unable to fill all orders received, and some of the consumers have been experiencing the hardships of a coal famine.

Anthracite—Shipments of anthracite continue irregular and in small volume. The increased movement, which was expected by some to follow the closing of navigation on the Lakes has not materialized and deliveries from retail yards are restricted to small quantities. In some parts of Detroit, chestnut is reported selling at \$12 a ton at retail.

Lake Trade—It is evident there will be very little stock at the upper docks at the opening of the 1917 navigation season and a strong, early demand for coal is expected. Owners of many of the freighters that are wintering at lower Lake ports expect to load coal for the first upbound trip but as yet no contracts are reported. Vessel owners are confident that with coal contracts on a much higher level than last year, a very substantial increase will be made in the 1917 rates. The carrying charge to Lake Superior ports is expected to be at least 50c. a ton, compared with the contract rate of 30c. in 1916.

CINCINNATI

The holiday lull has strengthened the market. Demand active, with prices higher. Accumulation of cars during the let-up will afford some relief.

The effects of the usual holiday lay-off at the mines are in full evidence accentuating the strength of the market. The comparative dullness of general business during the holidays has apparently not affected the demand for either steam or domestic coal. Prices have accordingly shown signs of rising to their recent extremely high levels again, sales of the better grades of bituminous nut and slack, both West Virginia and Kentucky, being reported as high as \$4.50@5 per short ton f.o.b. mine, with Pocahontas mine-run as high as \$5.50.

The domestic demand is very active, the recent gas shortage having caused a large increase in the number of domestic consumers using coal. The accumulation of cars over the holiday let-up will increase the movement during the following week, and this will relieve the shortage at many points to some extent, but continued strength is a practical certainty in all quarters of the market.

CLEVELAND

Railroad embargoes and cold weather forcing prices still higher. Several mines in Pittsburgh number eight district idle because of the car shortage.

The several railroad embargoes still in effect together with the cold weather and very poor car supply at the mines the past few days has forced the prices up again in the Cleveland market and today they are at the highest point touched last year; in fact they are the highest since the hard coal strike in 1902. Most of the mines in the Pittsburgh Number Eight district were idle several days on account of not having any cars to load and this greatly curtailed the supply of steam coal for this market.

Operators with free coal for spot shipment have been getting \$5 and \$5.25 at the mines for all grades while a few sales of coal on track at Cleveland have been made at \$7 f.o.b. cars Cleveland. This is on the basis of \$6.10 at the mines.

Notwithstanding the local fuel shortage, a few Lake boats are being loaded with coal to be ready to start for the Northwestern docks at the opening of navigation next spring.

Following are the market prices per short ton, f.o.b. Cleveland:

	Three-quarter	Mine-run	Slack
No. 8.....	\$6.50	\$6.50	\$6.25
Cambridge....	6.50	6.50	6.25
Middle Dist..	6.50	6.50	6.25
Hocking.....	6.50	6.50	6.25
Yough'gheny..	6.50	6.50	6.25
Pittsburgh....	6.50	6.50	6.25
Pocahontas....		8.00	
Fairmont.....	6.50	6.50	6.25

COLUMBUS

Business quiet due to the holidays and warmer weather. Output at a low point. Prices continue firm with indications of higher levels.

Domestic trade is still attracting considerable attention as dealers are making strenuous efforts to secure surplus supplies but the increasing car shortage and congestion at railroad centers has made it almost impossible to get much ahead. Retail prices are ruling high and no cutting is reported. Pocahontas is one of the strongest points with lump selling at \$7 to the consumer. Anthracite is also in good demand and prices are about \$10.25 for chestnut.

The steam business continues strong. Manufacturing is active especially in iron and steel. Railroads are taking a large tonnage for the movement of trains and many have been confiscating coal to keep their locomotives running. Very few large steam users have been able to accumulate any surplus and many are running from hand to mouth. A coal famine is threatened in many places, unless the car supply and railroad congestion is relieved. All steam prices are firm.

The output is low because of the holidays and also the poor car supply. The outlook for increased production is not good. Traffic managers of railroads are up in the air over congestion and if colder weather comes this will not be cleared up for months.

The board of purchase of Columbus has awarded a contract for approximately 6700 tons of Hocking nut, pea and slack for delivery in January and February to the George M. Jones Coal Co., of Columbus, at \$4.65 per ton.

The board also awarded a contract for about 900 tons of Hocking lump coal to be delivered to various small departments at \$5.10 to the Gem Coal Co.; the Fletcher-Williams Coal Co. bid \$5.20 for the same part of the contract.

Prices on short tons, f.o.b. mines are as follows:

	Hocking	Pomerooy	Eastern Ohio
Rescreened lump.....	\$5.00	\$5.00	
Inch and a quarter.....	4.75	5.00	\$5.00
Three-quarter inch.....	4.75	5.00	5.00
Nut.....	4.75	5.00	5.00
Egg.....	4.75	4.75	
Mine run.....	4.50	4.75	5.00
Nut, pea and slack.....	4.50	4.75	5.00
Coarse slack.....	4.50	4.75	5.00

LOUISVILLE

Car shortage again cause of complaint. Labor supply unsatisfactory and prices advancing. River coal beginning to arrive.

Recurrence of the car shortage in the Kentucky fields is reflected by partial embargoes, shipments for public utility plants being among the few exceptions to the rule. The embargoes are ascribed largely to the congestion North and East but the lack of coal equipment is also a considerable factor. Labor is at a premium and bonuses are in order over wide areas. Rapid rises in the stage of the Ohio River have been followed by the movement of considerable river coal. The first consignment to reach Louisville in more than a month arrived recently and consisted of a tow of 22 barges from Huntington, W. Va.

Prices are variable and quotations on free coal are frequently hedged in by conditions as to delivery or as to substitution. A \$5 quotation on eastern Kentucky block is not unusual and nut and slack has been selling up to \$3.85.

Western Kentucky, reporting a better car supply on the Illinois Central, quotes lump at \$3; mine-run, \$2.50@3 and nut and slack around \$2.50.

BIRMINGHAM

Trade has again picked up following holiday lull and the demand is good. Car supply improved and is not now such a serious factor.

The coal market is fast recovering from the slight inactivity which always prevails during the holidays and inquiries are healthy. Steam coal contracts are being closed on a basis of from \$2.50 to \$2.75 per net ton mines, which is from \$1 to \$1.15 over the prices of a year ago. The Birmingham Railway, Light and Power Co. closed a contract recently for approximately 30,000 tons for delivery during the next twelve months, and the Seaboard Air Line Ry. exercised an option for the renewal of its contract for 1917-1918 deliveries, its present contract not expiring until June 30, 1917. The demand for domestic grades is only fair.

The car supply has shown marked improvement recently and there is now little complaint on this score. The railroads have taken the bulk of the output during the past week, but the holidays have not seriously affected the production, and with the better car supply it appears that there will not be any acute scarcity of fuel from now on in this territory.

Coke

CONNELLSVILLE

Many furnaces banked through receiving no coke. Spot prices very high. Production and shipments greatly reduced.

The number of blast furnaces banked on account of not receiving coke increased last week, until at the close of the week 30 or 40 were idle. Coke shipments were very moderate in the week, not over about two-thirds of productive capacity, and this week does not promise any improvement, starting as it does with a holiday. The railroads are having so much difficulty moving pig iron and finished steel products that they have no incentive to make a special effort to move coke as that simply conduces to larger production of the other materials. Once coke cars are loaded they are getting through to destination a trifle less slowly than was the case a fortnight ago. Railroad officials are promising better conditions for the near future.

Spot furnace coke is readily bringing \$11, and there are rumors of \$12 having been paid. Sellers are rather reticent as to transactions made and it is the common belief that there is practically no spot coke offered that is not really due on contract. Foundry coke has been bringing \$12, with not much demand and very little offered. One operator who has almost invariably had spot foundry for sale has been out of the market for a week. There is no interest in contract coke. We quote: Spot furnace, \$11; contract furnace, nominal, \$4.50@5; spot foundry, \$12; contract, \$5.50@7.50, per net ton at ovens.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ended Dec. 23 at 333,948 tons, a decrease of 41,553 tons, and shipments at 328,975 tons, a decrease of 33,318 tons.

Buffalo—The demand is so insistent and the supply so short that shippers are asking almost any price. Doing the best they can the supply is not enough to fill the orders and quite a good many furnaces are wholly or in part idle, while others which were to be started up, as at Tonawanda, have had to be given up. Prices rule at about \$12 for best Connellsville foundry at the ovens. Low grades are \$2 less.

Chicago—Attempts by coke producers to obtain better car supply have been productive of no results. Shipments are mostly against definite sales or contracts made some time ago. The quantity of free coke in this market is nil. Conditions are unprecedented and have never been experienced before in the trade. Spot prices quoted are purely nominal, and are as follows per net ton f.o.b. cars Chicago:

Connellsville	\$10.00@12.00
Wise County	10.00@12.00
Byproduct foundry	11.00@12.00
Byproduct domestic	9.50@11.00
Gas house	8.00@10.00

St. Louis—On local coke no new orders are expected. The entire tonnage for foundry and smelting has been taken care of for several months to come. The same prevails on byproduct, domestic and gas house. On open market options the gas house wholesale price is \$6.75. St. Louis, and byproduct \$7.50. St. Louis. Danger of the local plant running out of fuel is causing a curtailment of its use until the rivers open up in the spring.

Birmingham—The demand for furnace and foundry coke is steady and the supply of free coke continues scarce; in fact there is no furnace coke to be had at all, and spot foundry has been sold during the last week at \$11 per net ton ovens, this figure being the present quotation. The Pratt Consolidated Coal Co. is repairing 60 bee-hive ovens, which will be put in blast as soon as possible, the output having been contracted for by a Birmingham company which has accepted a large contract with Mexican interests for shipments through 1917.

Middle Western

GENERAL REVIEW

Prices rise as buyers compete for available supplies. Steam demand very strong. Production reduced during holiday season. Anthracite and Eastern coals very tight.

The year closed with the Western markets at their highest pitch, and the trade has been facing a stiff demand which was made more strenuous by shortage of supplies, cold weather conditions and reduced production owing to lack of mine labor. Temperatures dropped close to the zero mark for several days, which rendered railroad service appreciably worse. A number of the Western carriers have had serious difficulty in obtaining enough coal supplies for engine use, and confiscations of commercial coal have been frequent. Steam plants have been extremely short, and generally have no reserve supplies to meet future requirements.

Dealers have also been clamoring for stocks, which has accentuated the upward tendency of

prices. Retailers have been apportioning their available supplies among customers in an effort to take care of all but giving no one their entire needs. Difficulties of the railroads continue, although in the Chicago district congested terminals have been cleared up and preferred attention given to the movement of coal, which has afforded relief. The holiday lay-off at the mines caused a marked diminution of production stopping it entirely in some sections, though in others personal efforts on the part of operators caused the men to work very steadily with little reduction in output.

Demand from the country districts is unceasing, and shipments have been comparatively heavy. The car supply at the mines is not any more promising, but this has been offset by the difficulty of obtaining sufficient men. In the Northwest congestions of coal shipments have appeared at the principal terminal points, and industrial plants are working on a very short coal supply, due to many shipments confiscated by the carriers. Dealers have shown a disposition to hold back anticipating better prices and a larger supply in January, but householders are trying to obtain sufficient coal to carry them through the winter and seem alarmed over the outlook.

Within the past ten days the Ohio River has been at a navigable stage, with coal moving down to such points as Cincinnati, Louisville and other river towns, which has softened the situation slightly in that territory. Southern coals have been absorbed readily in Northern markets at high prices. Illinois and Indiana mines have been working from 25 to 35 per cent. capacity during the week. It is rumored that some contracts on Eastern steam coals have been renewed at prices averaging \$1.25 above last year's figures.

CHICAGO

Visible supplies of coal about exhausted. Anthracite and smokeless grades very tight. Illinois and Indiana shipments greatly restricted. Prices at the highest level of the year.

All prices in the Chicago district reached the highest level of the year this week. Any kind of mine-run coal has brought from \$4 to \$4.50 and domestic sizes sold readily at \$5. Screenings have sold on about the same basis as mine-run. Special efforts on the part of operators, wholesalers and railroads to relieve the situation were made just before Christmas when things pointed to a serious coal famine, but car supply is again becoming tighter due to the failure of the carriers to get empties back to the mines promptly.

In Franklin and Williamson Counties the car supply has been very bad, even though the shortage of labor was quite pronounced. Cold weather has caused the demand to become extraordinary, with all sizes bringing new high prices. Spot prices on southern Illinois coals have held around \$4 for free steam sizes, and from \$4.50 to \$5 for domestic grades.

In central Illinois all differentials as to size and grade have disappeared, with the steam demand especially strong. Prices on all grades average from \$4 to \$4.50.

Chicago wholesalers have been offering Indiana operators from \$4 to \$4.25 per ton for spot domestic mine-run and screenings, with shipments far below normal during the week. A number of free shipments have been made to Michigan points at the highest prices ever made for Indiana production.

The smokeless situation is very stringent with little free coal reaching Chicago, and prices on mine-run, lump and egg run from \$5.25 to \$6.

Hocking and splint lump is quite strong, with little coal coming this way because of the car situation. The call for Hocking domestic lump is urgent at around \$5.50.

On Kentucky coals Millers Creek sold as high as \$5.75, with other grades averaging \$5. The market for Kentucky coals is restricted because of embargoes.

Anthracite is very tight. All the coal on the docks has disappeared and buyers are now dependent entirely upon railroad shipments which is not encouraging because of transportation terminals in the East being congested. Independents are receiving premiums as high as \$3.50 per ton for immediate deliveries. Some effort has been made by Chicago wholesalers to buy coal from docks located along the Lake north of Chicago, but little tonnage has been forthcoming.

Quotations in the Chicago market are as follows, per net ton f.o.b. cars at mines:

	Springfield	Fulton & Peoria Cos.	Clinton & Sullivan Cos.	Green & Knox Cos.	Carterville
Domestic lump.....	\$4.00@4.50	\$3.75@4.25	\$4.00@4.50	\$4.00@4.50	\$4.00@4.50
Steam lump.....	4.00@4.50	3.75@4.00	4.00@4.25		
Egg.....	4.00@4.50	3.75@4.25	3.75@4.25	4.00@4.25	4.00@4.50
Nut.....	4.00@4.50	3.50@4.00	3.75@4.25	4.00@4.25	4.00@4.50
Mine-run.....	4.00@4.25	3.75@4.00	3.50@4.50	4.00@4.25	4.00@4.50
Screenings.....	4.00@4.25	3.50@3.75	3.50@4.25	3.75@4.00	3.75@4.00
	Wmson. & Franklin Cos.	Saline & Harrisburg	Poca. & W. Va. Smokeless	Penna. Smokeless	Eastern Kentucky
Lump.....	\$4.00@4.50	\$4.00@4.50	\$5.50@6.00	\$5.50@6.00	\$4.75@5.50
Egg.....	4.00@4.50	4.00@4.50	5.50@6.00	5.50@6.00	4.50@5.00
Nut.....		4.00@4.25			4.00@4.25
No. 1 nut.....	4.00@4.50				
No. 2 nut.....	4.00@4.50				
No. 3 nut.....	4.00@4.25				
No. 1 washed.....	4.00@4.50				
No. 2 washed.....	4.00@4.50				
Mine-run.....	4.00@4.25	4.00@4.25	5.25@5.75	5.25@5.50	4.00@4.25
Screenings.....	4.00@4.25	4.00@4.25			

Hocking Lump \$5.25@5.50. Splint Lump \$5.50.

ST. LOUIS

Market unusually strong. Car supply better though still bad. Unusual demands from Chicago and the North. Steam demand exceptionally heavy. Record prices anticipated with cold weather prevailing.

The much looked for holiday slump did not materialize and the market is unusually active. A great many buyers delayed purchasing until the last week in the month, anticipating a slump, and now they are all active. The demand from Chicago continues, and that city is still in danger of a coal shortage. This demand has taken all the surplus tonnage off the St. Louis market and at times has left this city in danger of a fuel shortage.

Steam demand from the country continues strong. During the past week several railroads have placed orders for big tonnages. The market is also affected by the scarcity of cars on the Big Four in the Saline County district and coal that usually comes to the St. Louis market is going to the eastern part of Illinois and Indiana. Congestion at Detroit and Toledo prevents coal moving that way at present, but this congestion is expected to be moved soon and a large tonnage of coal from the St. Louis district may be shipped East again. Northern Minnesota, North and South Dakota, and a portion of Wisconsin and Michigan which are usually supplied with Lake coal are drawing heavily on the Illinois fields.

In St. Louis proper it is impossible to get as much as the outside market is bringing on account of the contract dealers. Steam prices, however, are oftentimes higher than retail quotations. Several towns in Illinois and Missouri have applied to St. Louis for coal recently. Some towns on the M & O. have had to haul coal 14 mi. cross-country from points on other roads, and at some places they have given up hope of getting coal and are using wood. This is on account of the poor management of certain railroads and the delay in handling cars especially by the Terminal at St. Louis.

Anthracite moved in freely the past week and some smokeless. The retail price on the first of the year was: Williamson and Franklin Co., \$4.75 to \$5; Mt. Olive and Staunton, \$4.50; Standard, \$4 to \$4.25; Pennsylvania anthracite chestnut, \$10; egg and stove, \$9.75; grate, \$9.50; smokeless, \$8.25 (none on hand); Arkansas semianthracite, \$8.50 to \$8.75.

The prevailing wholesale market is about 50c. below the market on coal shipped outside of St. Louis, and is per short ton f.o.b. mines:

	Williamson and Franklin Co.	Mt. Olive and Staunton	Standard
6-in. lump.....	\$3.50	\$3.50	\$3.50
3x6-in. egg.....	3.50	3.50	3.50
2x3-in. nut.....	3.50	3.50	3.50
No. 2 nut.....	3.50	3.50	3.25
No. 3 nut.....	3.50	3.50	3.25
No. 4 nut.....	3.50	3.25	
No. 5 nut.....	3.25	3.00	
2-in. screenings	3.25	3.25	3.00@3.25
2-in. lump.....			3.25@3.50
3-in. lump.....		3.50	
Steam egg.....		3.50	3.25@3.50
Mine-run.....	3.50	3.25	3.00@3.25
Washed			
No. 1.....	3.50	3.50	3.50
No. 2.....	3.50	3.50	3.50
No. 3.....	3.50	3.50	3.25
No. 4.....	3.50	3.25	3.25
No. 5.....	3.25	3.00	3.00

Williamson & Franklin County rate, 72½c. Others, 57½c.

KANSAS CITY, MO.

Spot coal is selling in the Kansas City market at \$3.75@4.25. There is practically no coal in the local yards and the Central Coal and Coke Co. avers that it has in some instances been compelled to pay \$4.50 per ton for coal to be used at their yards while at the same time they are delivering whatever coal they produce at the contract price of \$2.25. This company is delivering only contract coal and practically all of the large producers are doing the same.

One lone car of Pennsylvania anthracite was received here Dec. 30 by the Laning Harris Coal Co. This is part of a lot of 60 cars ordered in the spring for August delivery.

General Statistics

PENNSYLVANIA RAILROAD

The following is a statement of shipments over the Pennsylvania Railroad Co.'s lines east of Pittsburgh and Erie for November and the 11 months of 1915 and 1916, in short tons:

	November		11 Months	
	1916	1915	1916	1915
Anthra....	1,048,292	1,194,794	11,034,858	9,874,133
Bitumin....	3,842,275	4,307,041	44,338,716	40,215,984
Coke.....	1,089,413	1,220,149	13,142,656	10,822,498
Total....	5,979,980	6,721,984	68,516,230	60,912,615

SAULT STE. MARIE CANALS

The following is a comparative statement of coal shipments through the Sault Ste. Marie Canals for the full season this year and last year, in short tons:

	1915	1916
Hard.....	2,030,750	2,210,219
Soft.....	11,326,328	13,912,900
Total.....	13,357,058	16,123,119

Foreign Markets

GREAT BRITAIN

Dec. 14—There is no change of any note to report in the Welsh coal market. A modification of the limitation scheme for French, Mediterranean and Italian ports may, however, be looked for any day, and this will doubtless have a strengthening effect.

The market is quotable as follows:

Best Welsh steam.....	Nominal
Best seconds.....	Nominal
Seconds.....	\$6.96@7.20
Best dry coals.....	6.48@6.72
Best Monmouthshires.....	6.60@6.84
Seconds.....	6.24@6.48
Best Cardiff smalls.....	4.56@4.80
Cargo smalls.....	4.20@4.32

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both net, exclusive of wharfage.

Freights—Tonnage is still scarce and rates maintained. A readjustment may be looked for, if and when, under the new ministry of shipping control, steamers are allotted to certain destinations.

Gibraltar.....	\$11.40	Port Said.....	\$19.20
Marseilles.....	14.04	Las Palmas.....	9.00
Genoa.....	14.28	St. Vincent.....	9.60
Naples.....	13.80	River Plate.....	12.60
Alexandria.....	19.80		

Exports—British exports for November and the 11 months of the past two years were as follows:

To	November		Eleven Months	
	1915	1916	1915	1916
Russia....	1,001		42,559	4,804
Sweden....	214,014	135,311	2,488,208	1,505,182
Norway....	165,480	166,703	2,457,669	2,161,194
Denmark....	173,384	168,693	2,914,477	2,121,924
Netherlands	154,703	136,313	1,655,036	1,221,547
France....	1,388,211	1,284,780	16,215,273	16,201,666
Portugal ¹	66,861	63,815	938,352	807,679
Spain ¹	166,847	227,760	1,462,456	1,786,530
Canary.....	23,317	16,328	447,261	384,203
Italy.....	443,432	460,413	5,405,964	5,436,527
Greece....	12,280	8,390	309,198	158,118
Turkey....		2,768	10,324	5,987
Algeria....	53,620	49,695	846,835	682,377
Portugal ²	36,046	19,961	192,582	210,599
Chile.....	7,248	469	46,288	24,035
Brazil....	23,322	3,108	469,878	187,952
Uruguay....	29,012	8,511	299,543	174,836
Argentina	129,004	53,063	1,454,997	703,134
Channel				
Is.....	7,719	6,721	117,103	113,495
Gibraltar	37,730	44,242	334,258	480,722
Malta.....	5,113	7,834	132,413	71,456
Egypt ³	103,388	84,628	1,258,176	767,373
Aden ³	15,006	7,653	127,371	23,344
India.....	686	750	24,486	10,808
Ceylon....	4,757		43,487	25,726
Miscell....	40,590	40,143	553,335	467,992
Coke.....	110,946	121,842	909,134	1,385,438
Briquettes	55,585	104,663	1,143,245	1,251,081

Total... 3,469,302 3,224,557 42,299,908 38,375,729
Bunker... 931,614 1,012,668 12,677,086 11,973,652

¹ Includes Azores and Madeira. ² Including Anglo-Egyptian Sudan. ³ And dependencies. ⁴ And Canaries. ⁵ West Africa.

Note—The figures in the above table do not include Admiralty and certain other shipments.